

Cal.
HODDER'S
ARITHMETICK.

O R, Adams 8. 66. 66

That necessary **A R T**
made most easie.

Being explained in a way fa-
miliar to the capacity of any that
desire to learn it in a little time.

By *James Hodder*, Schoolmaster,
near the *Royal Exchange*.

The Fourth Edition, much enlarged.

L O N D O N,

Printed by *J. Darby*, for *Tho. Rooks*, at the
Lamb and Ink-bottle at the East end of
St. Paul's, near the School : [*where is*
sold the best Ink for Records] 1667.

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TO HIS
REALLY LOVING
AND MOST
WORTHILY HONOURED
FRIEND,

JOSEPH DEWYE,

MERCHANT & CITIZEN
of LONDON:

JAMES HODDER,

In token of true Gratitude
for unmerited Kindnesses, humbly

DEDICATETH

This Manuel of

ARITHMETICK.

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To the READER.



Having for sundry years kept a Writing-School in this City, and thereby gained some experience in that commendable Art, I thought good heretofore to publish somewhat thereof.

And now for the better compleating Youth as to Clerk-ship, and Trades, I am endued to publish this small Treatise of Arithmeticks which though it be dedicated more particularly to my much honoured Friend, yet being assured he can be content that others should partake of the benefit thereof, I make bold thus to communicate it.

I need not go about to speak any thing in praise of Arithmetick, but shall willingly submit what is here treated of, to the candid censure of the more judiciously skilful.

And as I shall condemn no mans diligence in what he hath formerly done, so I think none will blame my endeavours at the present; for though I know it impossible to please every man, and therefore am not solicitous how to do it; yet according to the ability which God hath given me, I have laboured to make a

more

To the Reader.

more clear discovery of some intricacies in this Art, than to my knowledge hath hitherto been: which perhaps may not seem to be set out in so gallant a dress as some others; but I dare aver it to be done with as much plainness, facility and shortness, as any that I have yet observed.

Thus not fearing, Gentle Reader, lest any man should scorn my labours, because I seem to undervalue them by letting others have the use, profit and pleasure thereof at so small a rate, I refer my self and them to thy consideration; and if after perusal and trial made, thou kindly accept what I lovingly offer, it shall abundantly satisfy him that is devoted to serve God, and profit others in his calling; and desires to remain,

*Ready to pleasure thee, whether
known or unknown to*

JAMES HODDER.

The Author keepeth School in the Token-house-Garden at Loathbury, near the Royal Exchange, London, where Youth may be Tabled for their better proficiency.

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The Stationer to the READER.

THe Authors exact accomplishment and perfection in the *Rudiments* of this most necessary and useful Art of *Arithmetick* (it being the Basis of all other Arts and Sciences) his *Eminency* in his numerous and speedy teaching the same induced me to sollicite the Author to oblige both the present and future Generation, by emitting in Print, his rare *Method* in this noble *Science*; which he so ingeniously performed, that in this bad time of trade of Books, in less than ten months I sold of them 1550. There being very few of this kind yet set forth by any Teacher of this Art; and as I am informed those which are extant, of very little use to the *Learner*, without the help of an expert *Tutor*. I conceive none so well can lay down fit Reasons for every capacity of the *Learner*, as the practical *Teacher*.

That this may do the Work, which all do but pretend to do, to make this *Edition* (in every Rule thereof, most plain to all capacities) I delivered to several Professors

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The Stationer to the Reader.

fors and Students in this Art, Books of the former Edition, desiring them to make their exceptions of what imperfection or obscurity they could find therein. All which being by our *Authors* Skill and Industry thoroughly considered of, he hath digested the *Rules* thereof into so plain and easie a method, as may suit with the capacity of every *Learner*. All former Errors, either of *Printer*, or the *Author* by reason of his great practice, being now fully amended.

Here therefore *Reader*, I present thee for a small price, an inestimable *Jewel*, the most experienced and accomplished way of *Teaching* and *Practising* this Art, which extendeth its bounds as far as the utmost point on this side Eternity. Farewel.

Thine,

THO. ROOKS.

*A further Advertisement of the Stationer
to the Reader.*

The former you may observe was directed to the second and third Impressions. Now I desire your candid ingenuity further to observe, that these Books of the third Edition are sold and out of print, and now I present you with a 4th Edition, further corrected and purified from Errors by the Author.

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The Contents.

Chap. 9. Addition of Fractions the common way, and two other wayes more expeditious.

Chap. 10. Substraction of Fractions.

Chap. 11. Multiplication of Fractions.

Chap. 12. Division of Fractions.

Chap. 13. The Rule of Three, direct and indirect, in whole numbers, wrought four several ways; with a direction how to work any Question upon the Rule of Three, without troubling the head with the distinction of direct and indirect.

Chap. 14. The Rule of Three in Fractions.

Chap. 15. Practice with very plain and easie Tables.

Chap. 16. The double Rule of Three, consisting of five numbers.

Chap. 17. Very brief Rules for Interest, and Interest upon Interest; also, by the help of a plain Table, to know what any sum of money comes to, Interest upon Interest, for twenty one years or under, at one working by the Rule of Three.

Another Table, to know what any Annuity will amount unto for the same time, at one working, by the said Rule.

Chap. 18. The Rule of Fellowship, or Company without time, and Fellowship with time.

Chap. 19. The Rule of Bartar.

Chap.

The Contents.

Chap. 20. *Equation of time for Payment of money.*

Chap. 21. *Rebate or Discount.*

Chap. 22. *Exchange of moneys from one Country to another, and to know at what rate the Exchange is made either for Money or Ware.*

Chap. 23. *To know what is gained or lost per cent. in the sale of any Commodity at such a price; — and what it must be sold for to gain or lose so much per cent. Likewise having gained or lost so much — per cent. to know what it cost.*

And having gained so much per cent. when sold at such a price, what shall be gained or lost when sold at another price.

Chap. 24. *Allegation medial and alternate.*

Chap. 25. *Instructions for the Measuring of any Superficies, as Board, Glass, Hangings, Pavements, &c. as also for the Measuring Solids, as Timber, Stone, &c.*

There is newly printed Mr. Cocker's Book, called, *The Tutor to Writing and Arithmetick.*

Chap



CHAP. I.

The Definition of Number.



Number is a multitude of Unites put together ; as 2, 3, 4, 5, 6, &c.

Therefore an Unite is properly no number, but the original or beginning

number, for it being multiplied or divided by it self, is resolved again into it self, without any increasement or decrease-
ment.

N U M E R A T I O N.

Numeration is that part of Arithmetick whereby one may rightly value, express, and write any number or sum propounded

To the attaining whereof observe, that 1 numbers are expressed by these characters following, whose simple

B

value

value by themselves considered, you may here take notice of.

one. two. three. four. five. six. seven. eight. nine. cypher.
1. 2. 3. 4. 5. 6. 7. 8. 9. 0.

The Cypher serveth to make up the number of places, but of it self signifies nothing.

Every figure hath two values, where of one is alwayes certain, and hath its own signification; but the other is uncertain, by reason of the uncertainty of the place where it may happen to stand.

A place we commonly call a space in which a figure standeth; and look how many figures there are; so many places there are by which they are valued.

Every figure in the first place simply betokeneth it self; but in the second place, which is towards the left hand is ten times so much as it was in the place before, and so increaseth its value according to its place; as you may see in the Table following.

Table following.

Millions.
X. Millions.
9
9
9
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Wh
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ing
ner,
lions
three
A
the
next
Unit
valu
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Numeration Table.

Millions.
 Millions.
 Thousands.
 Thousands.
 Hundreds.
 Tens.
 Units.

9 8 7 6 5 4 3 2 1.

The first place.

9 8 7 6 5 4 3 2 1.

987 mill. 654 thou. 321

9 8 7 6 5 4 3 2.

98 mill. 765 thou. 432

9 8 7 6 5 4 3.

9 mill. 876 thou. 543

9 8 7 6 5 4.

987 thousand 654

The 9 8 7 6 5.

98 thousand 765

left hand, 9 8 7 6.

9 thousand 876

9 8 7.

987

9 8.

98

9.

9

Which you must read beginning from the last place on the left hand, and proceeding to the first at the right, on this manner, viz. Nine hundred eighty seven millions, Six hundred fifty four thousand, three hundred twenty one.

And for the better understanding of the Table, observe, that the first figure next the right hand, is the place of Units, and signifies but his own single value; as the figure of 1 but one, 2 but

two, 3 but three, &c. But where two or more figures are joyned together, the figure in the second place towards the left hand, betokeneth his own single value ten times; and so in the third place signifies his own value an hundred times; in the fourth place a thousand times.

Example. 6 in the fourth place is six thousand: 6 in the third place is six hundred: 6 in the ninth place, is six hundred millions.

And thus you see the value of the figure is according to the place it standeth in.

The names of the places therefore you must be sure to get by heart.

To help you in the expressing of great numbers, you may make a period or prick with your pen between every three figures beginning at the right hand: as in this *Example*:

123.456.789. Here you see is one hundred twenty three, four hundred fifty six, seven hundred eighty nine: Thus you must express all figures. But to know the value of them, you must begin at the right hand, and reckon towards the left, according to the precedent Table, and you will find

Chap. 1.

Numeration.

find them to be: One hundred twenty three millions, four hundred fifty six thousand, seven hundred eighty nine.

There are three sorts of numbers.

1. A Digit.

2. An Article.

3. A Mixt or Compound.

All numbers not exceeding the nine Unites, are called Digits: as, 1, 2, 3, 4, 5, 6, 7, 8, 9.

Articles be numbers consisting of a Digit and a Cypher: as, 10, 20, 30, 40, 50, &c.

A Compound is a number consisting of both; as 13, 14, 15, 16, 17, &c.

CHAP. II.

ADDITION,

Without the lesser Denominations.

BEfore I begin to acquaint you with the working of any of the Rules following, I shall (all along in their proper places) first shew you the nature and meaning of the Rules; and secondly, the manner of their working.

What Addition teacheth.

Addition teacheth you to add two or more sums together, to make them one whole or total sum.

Example.

Received at several times these particular sums following, viz.

At one time	341
At another time	158
More	217
More	596
More	179
I desire to know how much } was received in all ? }	1491

I. For the working of this, and all others of this kind, you must begin with the first, or lowermost figure at your right hand, saying, 9, 6, 7, 8, and 1, make 31; then set down the 1 in a line underneath, and carry the 3 unto the next place, where 7, 9, 5, 4, and 3 that I carried make 29, which 9 set down, and carry the 2 unto the next place towards your left hand, saying, 1, 5, 2, 1, 3, and 2 that I brought, make 14 set down. So that you see all the particulars do make 1491.

A general Rule.

For sums of one Denomination in Addition,

tion, observe to set down all that is above ten, to other tens, and under ten; and for every ten one carry one to the next place, until you come to the last, which must alwayes be set down; as in the former Example, and this following, cular appeareth.

	2734
341	3945
158	6542
217	5763
596	9278
179	20974

Here I think it not amiss to advise you to be sure, for your clearer working, to set down the figures of every rank in a straight line under one another: as you see in the foregoing sums, Unites under Unites, Tens under Tens, &c.

Addition of Money with the lesser Denominations.

II. I need not here to acquaint you, that four farthings make a penny; twelve pence a shilling; and twenty shillings a pound.

But thus much I desire you to mind in all Additions and Substractions, the Title of your Account, and how many of the first Denomination do make one of the second, and how many of the second do make one of the third, and how many of the third do make one of the fourth; and so in this manner if there are more. The observation of this will much facilitate the work, and save both you and me a great deal of labour; therefore I shall only give one or two examples of each cast up to your hands.

For the effecting of this, consider, as before, how many of the first Denomination do make one of the second (which is here 20). Therefore for every 20 shillings, carry one pound to the pounds: as thus, 1, 6, 8, 7 and 1 shilling is 23 shillings. Then come down upon the Tens, and say, 23 and 10 is 33, and 10 is 43, and 10 is 53, and 10 is 63, and ten is 73, and ten is 83 shillings; now 83 shillings being 4 pound 3 shillings, set down only the 3 shillings, and carry 4 to the next; saying, 9, 1, 8, 1, 7, and 4 that I carried in my mind, is 30; set down 0, and carry the three to the next, saying, 1, 7, 3, 2 and 3 I carried, is 16; set down 6, and carry one

one to the next, saying, 3, 4, 1, 1, 1, 3, and 1 that I carried is 14; which by reason there is not any other place to carry it unto, only set it down according to the Example.

l.	s.
327	11
101	10
100	17
138	18
471	16
319	11
<hr/>	
1460	3
<hr/>	

As before, so again, consider the Title of your Account, and how many of the one do make the other; then begin with the first figures at your right hand, 5, 7, 1, 8 and 1, which being added together make 22, and coming down upon the tens say, 22 and 10 is 32, and 10 is 42, and 10 is 52 (and so on if there were more.) Now consider how many shillings 52 pence make, viz. 4 shillings and 4 pence: set down the 4 pence, and carry the 4 shillings to the shillings, saying, 4 that I carry and 8 is 12, and 7 is 19, and 1

is 20, and 3 is 23, and 6 is 29, and 1 is 30, then come down upon the tens, 40, 50, 60, 70, 80, and 10 is 90 shillings; which is 4 pound 10 shillings; set down the 10 shillings, and carry the 4 pound to the pounds, saying, 4 and 6 is ten, and 1 is 11, and 5 is 16, and 7 is 23, and 1 is 24, which four set down, and carry the 2 unto the 9, which will make 11, and 4 is 15, and 6 is 21, and 4 is 25, and 1 is 26, and 1 is 27, which set down, and the total amounts to 274*l.* 10*s.* 4*d.* as you may see in the Example.

<i>l.</i>	<i>s.</i>	<i>d.</i>
11	11	11
10	18	8
47	13	10
65	11	11
41	17	7
96	18	5
274	10	4

You may make a prick with your Pen at every 4 in the farthings, and at every 12 in the pence, and at every 20 in the shillings: but this way is neither so neat nor commendable; for if you once prick false, you must prick it all over again, which will look like so many blots, and

make

make you more subject to mistake.

Therefore I recommend these two Tables following to you to be gotten perfectly by heart (before you adventure upon Addition) as, 1 shilling is 12 pence, 2 shillings is 24 pence, and so on.

Note that

s.	d.	d.	s.	d.
1	is--12	20	is--1--8	
2	is--24	30	is--2--6	
3	is--36	40	is--3--4	
4	is--48	50	is--4--2	
5	is--60	60	is--5--0	
6	is--72	70	is--5--10	
7	is--84	80	is--6--8	
8	is--96	90	is--7--6	
9	is--108	100	is--8--4	
10	is--120	110	is--9--2	
11	is--132	120	is--10--0	
12	is--144			

The Proof of Addition.

Add all the sums again (except the uppermost, which is here 300 l. 11 s. 6 d.) and then add the Total thereof unto the said uppermost line, and if it make the just sum of the first Total, it is true, otherwise not.

Example

12 The Proof of Addition. Chap. 2

Example.

l. s. d. qrs.

300-11-06--2

102-15--11--1

106-17-10--0

141-18-11--1

601-11-11--1

314-10-10--2

611-11-11--1

Total-2179-19--0--0

1879--07--5--2

Proof.

2179--19--0--0

Addition of Cloth Measures.

III. Note that 4 nails is one quarter of a yard, one yard 4 quarters, one ell Flemish 3 quarters of a yard, one ell English 5.

You see the Title of your Account is yards, quarters, and nails : now observe how many nails make one quarter, which is four. Therefore for every 4 carry one quarter to the quarters ; and likewise for every 4 quarters, which make a yard, car-

ry

ry one yard to the yards, and in the yards, or last denomination (of any Addition) for every 10 carry one to the next place, until you come to the last rank ; which total set down, as in these Examples.

yrd. qr. na.
 371--1--1
 106--3--2
 410--2--3
 716--3--1
 151--2--3
 171--1--2
 412--1--1
 601--3--2
 912--2--3

 3855--2--2

yrd. qr. na.	Ell Eng. qr. na.	Ell Flem. qr. na.
31--1--2	47--1--2	54--1--2
27--2--3	-----	16--2--1
14--1--2	31--2--3	31--1--2
16--1--3	41--4--3	91--2--1
35--3--1	17--1--2	31--2--3
27--2--0	38--3--1	-----
-----	27--1--0	226--1--1
153--9--3	-----	-----
-----	203--4--1	-----
-----	-----	-----
-----	156--2--3	-----
-----	-----	-----

Proof 203--4--1

Addition

12 The Proof of Addition. Chap. 2

Example,

l. s. d. qrs.

300-11-06--2

102-15-11--1

106-17-10--0

141-18-11--1

601-11-11--1

314-10-10--2

611-11-11--1

Total-2179-19-0-0

1879-07-5-2

Proof.

2179-19-0-0

Addition of Cloth Measures.

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ry

ry one yard to the yards, and in the yards, or last denomination (of any Addition) for every 10 carry one to the next place, until you come to the last rank ; which total set down, as in these Examples.

yard.	qr.	na.
371	--1	--1
106	--3	--2
410	--2	--3
716	--3	--1
151	--2	--3
171	--1	--2
412	--1	--1
601	--3	--2
912	--2	--3
<hr/>		
3855	--2	--2
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yard.	qr.	na.	Ell Eng.	qr.	na.	Ell-Flem.	qr.	na.
31	--1	--2	47	--1	--2	54	--1	--2
27	--2	--3	---	---	---	16	--2	--1
14	--1	--2	31	--2	--3	31	--1	--2
16	--1	--3	41	--4	--3	91	--2	--1
35	--3	--1	17	--1	--2	31	--2	--3
27	--2	--0	38	--3	--1	---	---	---
---	---	---	27	--1	--0	226	--1	--1
153	--9	--3	---	---	---	---	---	---
---	---	---	203	--4	--1	---	---	---
---	---	---	---	---	---	---	---	---
---	---	---	156	--2	--3	---	---	---
<hr/>			<hr/>			<hr/>		
Proof			203	--4	--1			
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Addition of Wine-Measure.

IV. The same order that is set down in the second Section of this Chapter, is here to be observed, and likewise in all the Additions following.

Example.

For 2 pints carry one quart, for 2 quarts one pottle, for 2 pottles one gallon, for 6 gallons one hoghead, for 4 hogheads one tun.

Example.

Tuns.	hogsh.	gall.	pottl.	qrts.	pints.
321	— 3	— 16	— 1	— 0	— 1
102	— 1	— 10	— 1	— 1	— 0
317	— 1	— 15	— 0	— 1	— 1
241	— 2	— 30	— 1	— 0	— 1
317	— 1	— 40	— 1	— 1	— 1
171	— 3	— 10	— 0	— 1	— 0
141	— 2	— 10	— 1	— 0	— 1
1131	— 1	— 17	— 1	— 1	— 0
To. 1745	— 0	— 26	— 1	— 1	— 1
1423	— 1	— 10	— 0	— 1	— 0
Pr. 1745	— 0	— 26	— 1	— 1	— 1

Addition

Addition of Troy-Weight.

For 24 grains carry one penny weight; for 20 penny weight, one ounce; for 16 ounces one pound.

lb	3	dw.	gr.
371	11	19	23
102	10	10	11
413	11	16	10
176	03	19	11
912	10	18	10
341	11	13	22
<hr/>			
2320	00	18	15
<hr/>			

lb	3	dw.	gr.
41	10	12	10
31	11	14	11
10	10	15	15
11	11	11	10
10	10	17	16
<hr/>			
107	07	16	14
<hr/>			

Addition of Haverdupoise Weight.

For 16 ounces, carry one pound; for 28 pound, carry one quarter; for 56 pound two quarters; for 84 pound, three quarters; for 112 pound, four quarters (or one hundred weight) for 20 hundred one tun.

Example.

C. qrs. lb 3
 91--3--27-15
 10--1--16-14
 11--2--10-10
 31--1--11-12
 71--1--11-10
 10--3--15-11

 227-2--10-08

Tuns. C. qrs. lb 3
 91--19--3--17--15
 16--11--1--11--11
 91--11--2--11--14
 60--14--3--10--11
 31--11--2--11--13
 78--10--1--13--13
 41--11--2--11--11

Addition of dry Measures.

For 16 pints carry one peck; for 4 pecks carry one bushel.

Bush. pecks. pints.
 317--1--10
 102--3--11
 413--2--10
 171--1--11
 106--3--10

 1112--1--04

Bush. pecks. pints.
 400--1--10
 103--2--13
 710--1--11
 317--1--10
 106--3--11

Addi

Addition of Time.

For 60 minutes carry one hour; for 24 hours, one day, for 365 dayes, one year.

Tears. Dayes. Hours. Minutes.

37—150—11—12

31—110—10—10

14—175—15—23

10—101—11—11

11—137—12—14

10—101—11—13

115—46—23—23

Addition of long Measure.

For 12 inches carry one foot, for three feet one yard.

Yards. Feet. Inches. Yards. Feet. Inches.

81—1—10

300—2—11

17—2—11

101—1—10

10—2—07

602—2—11

31—1—10

101—1—10

41—2—11

101—0—08

10—1—10

710—1—11

810—2—10

104—1—11

CHAP.

CHAP. III.

SUBTRACTION
of Money.

Subtraction teacheth to take any lesser number out of a greater, and to know what remains.

I. Subtraction of one Denomination.

First, set down the greater number, from which you would subtract, and then place the lesser number to be subtracted under it, as in Addition, with a line drawn beneath them.

Example.

Received—379

Laid out—136

Then take the first figure towards the right hand in the sum to be subtracted from the figure over it; as 6 from 9, and there remains 3; which 3 set down, then 3 from 7, and there remains 4; lastly, 1 from 3, and there remains 2, which 2 set down.

01—1—018

01—1—018

01—1—018

379

136

243

And there remains unpaid — 243

Bu

But I shall give you one or two Examples, wherein the figures of the sum to be subtracted, are some of them greater and some lesser than those you must subtract from: therefore, if there be only one denomination, borrow ten and add to the upper figure: as in this Example.

Received—130624

Paid out—104146

Remaineth—026478

Say 6 from 4 I cannot, but 6 from 14 and there remains 8, which set down: 1 that I borrowed and 4 make 5; 5 from 2 I cannot, but 5 from 12 I may take, and there remains 7; which 7 set down: Then 1 that I borrowed and 1 is 2, 2 from 6 and there remains 4; now 4 from 0 I cannot, but 4 from 10 and there remains 6; then 1 that I borrowed and 0 is 1; now 1 from 3, and there remains 2: Then lastly, 1 from 1 and there remains nought.

So that if you take 104146 from 130624, there remains 26478.

II. Sub-

11. Subtraction of several Denominations.

But if there be several Denominations then observe as before in Addition of money, how many of the first make one of the second, and so on: and if the figure of figures be greater than those you are to subtract from, borrow one from the next Denomination, and subtract from it: and add the Remains to the upper figure.

	l.	s.	d.
Received	275	11	3
Laid out	196	12	5
—————			
Remains	078	18	10

Example. Take 5 d. from 3 d. I cannot but 5 d. from a shilling or 12 d. and there remains 7 d. which add to the 3, makes 10 d.

Again, one shilling that I borrowed (for you must be sure to pay what you borrow) and 12 is 13, which to take from 1 I cannot; then say 13 s. from 20 s. and there remains 7, and the 11 makes 18 which set down.

Again,

Again, one that I borrowed, and 6 is : now 7 from 5 I cannot, but 7 from 15 and there remains 8 : then 1 that I borrowed and 9 is 10 ; now 10 from 7 I cannot, but 10 from 17 and there remains 7, which set down ; then 1 that I borrowed and 1 is 2 ; 2 from 2, and there remains nothing.

	<i>l.</i>	<i>s.</i>	<i>d.</i>
So that — — —	196	12	5
being taken from — — —	275	11	3
there remains — — —	078	18	10

And thus in any other of this nature, observe that at the same you carried in addition, the same you must borrow in subtraction ; as 12 in the pence, 20 in the shillings, and 10 in the last denomination.

I need say no more, only I shall acquaint you how to know whether your work be well done or not.

Add the remains to the sum subtracted, and if it make the same sum with that from which you did subtract, it is true, else not. As in your former examples, 78 *l.* 18 *s.* 10 *d.* and 196 *l.* 12 *s.* 5 *d.* being added, do make the same sum with the sum received.

Sub-

Substraction of Cloath Measure.

	<i>Yards, qrs. na.</i>	<i>Ell Flem. qrs. na.</i>
Bought	37 12 -1---2	Bo. 41 71 --2---
Sold	19 13 --2---1	So. 13 17 --2---
	<hr/>	<hr/>
Rema.	17 98 --3---1	Re. 28 53 --2---
	<hr/>	<hr/>
Proof.	37 12 --1---2	
	<hr/>	

	<i>Els Eng. qrs. na.</i>
Bought	47 16 210 --2---1
Sold	109 13 17 --3---3
	<hr/>
Remains	362 48 92 --3---2
	<hr/>

Substraction of Haverdupoix Weigh

For the better understanding of the Rule, observe (as you did before) the Title of your Account; and where you cannot take one number out of another, take it out of the next denomination: as you see here; 12 from 10 cannot, but 12 drams from one ounce resteth 4, and the 10 make 14: 14 from

ap. Chap. 3. *Subtraction.* 23

cannot, but 14 from 16, and there remains 2; 2 and 11 is 13: Now 1 that I borrowed and 14 is 15; 15 from 11 I cannot, but 15 from 28, and there remain 13; 13 and the 11 is 24: Now 1 that I borrowed and 3 is 4; 4 from 2 I cannot, but 4 from 4, and there remains nothing; but 2 is 2, which you must set down: Now that I borrowed and 8 is 9; 9 from 7 I cannot, but 9 from 17 and there remain 8: Now 1 that I borrowed and 1 is 2, 2 from 4 and there remains 2.

	C.	qr.	lb	oz	dr.
Bought	47	2	11	11	10
Sold	18	3	11	13	12
	<hr/>				
Remains	28	2	24	13	14

The

CHAP. IV. MULTIPLICATION

The Multiplication Table.

2 times	{ 2 }	is	{ 4 }	5 times	{ 5 }	is	{ 25 }
	3		6		6		30
	4		8		7		35
	5		10		8		40
	6		12		9		45
3 times	{ 3 }	is	{ 9 }	6 times	{ 6 }	is	{ 36 }
	4		12		7		42
	5		15		8		48
	6		18		9		54
	7		21				
4 times	{ 4 }	is	{ 16 }	7 times	{ 7 }	is	{ 49 }
	5		20		8		56
	6		24		9		63
	7		28				
	8		32				
5 times	{ 5 }	is	{ 25 }	8 times	{ 8 }	is	{ 64 }
	6		30		9		72
	7		35				
6 times	{ 6 }	is	{ 36 }	9 times	{ 9 }	is	{ 81 }
	7		42				
	8		48				
7 times	{ 7 }	is	{ 49 }	10 times	{ 10 }	is	{ 100 }
	8		56				
	9		63				
8 times	{ 8 }	is	{ 64 }				
	9		72				
9 times	{ 9 }	is	{ 81 }				
10 times	{ 10 }	is	{ 100 }				

FOR the clearer understanding of this Table, observe the figures in the Margent, 2, 3, 4, &c. and the word [times] adjoyning to them; say 2 times 2 is 4, 2 times 3 is 6, 2 times 4 is 8, 2 times 5 is 10, &c. After you know well how to read it within Book, you must of necessity get it very perfectly by heart, before you can make any farther progress in this Art.

The use of Multiplication.

Multiplication serveth instead of many Additions, and teacheth of two Numbers given to increase the greater as often as there are Unites in the lesser.

There are three things strictly to be observed, viz.

1. The *Multiplicand*, or sum to be multiplied.
2. The *Multiplier*, or sum by which you multiply.
3. The *Product*, or sum produced.

Ask how much is 7 times 52, or in 52 weeks how many dayes there are?

If you should add 7-52 times, it would

be a tedious work ; but Multiplication will do that at once, that Addition should do many times : in Multiplication therefore first set down the greatest number, and the lesser under it, beginning at the right hand and multiply every figure of the Multiplicand, by each figure of the Multiplier then (do as in Addition) set down all that is under ten, or above ten, or tens, and for every ten (or Article) carry one to the next place, and in the last place set down the tens.

Example.

52 *Multiplicand.*

7 *Multiplier.*

364 *Product.*

Begin with the Multiplier, saying, times 2 is 14, set down the 4 under and carry 1 to the next place, saying, times 5 is 35, and 1 that I carried is 3 which set down as you see in the Example so that 7 times 52 is 364.

In 3712 shillings, how many farthings or how much is 48 times 3712?

Be careful in setting the figures of the Multiplier under the Multiplicand,

uni

unites must be under unites, 3712
tens under tens, hundreds 48
under hundreds; and having
rightly placed your figures, 29696
then proceed according to
your former Example, saying, 8 times 2
is 16, set down 6, and carry 1 to the
next place, then say, 8 times 1 is 8, and
1 that I carried is 9, set down 9, and car-
ry nothing, saying, 8 times 7 is 56, set
down 6, and carry five to the next place,
saying 8 times 3 is 24, and 5 is 29, which
set down. And having done with the first
figure of the Multiplier, cancel it with a
dash of the Pen, and proceed to the next,
saying, 4 times 2 is 8, which 8 set down
directly under the Multiplier,
then say, 4 times 1 is 4, which 3712
set down, then 4 times 7 is 28, 48
which 8 set down, and carry 2,
then 4 times 3 is 12, and 2 29696
that I carried is 14, which be- 14848
ing set down, you shall find
48 times 3712 is 178176. 178176

How to Multiply by 10, 100, 1000, 10000, &c.

Look how many Cyphers you have in your Multiplier, add them to your Multiplicand, and the total thereof shall be the product.

Example

Multiply	63	by	10	facit	630
	36		100		3600
	85		1000		85000
	92		10000		920000
	73		100000		7300000

How to Multiply by 20, 40, 300, 5000, &c.

As many Cyphers as there are in the Multiplier, set them down towards the right hand, and multiply the rest as before is taught.

<i>Example.</i>	37	232
	20	300
	740	69600

How

How to prove Multiplication.

First cast away the nines of the Multi-
plicand (in your former example) 3712,
saying, 3 and 7 is 10, cast away 9, and
there remains 1; then 1 and 1 is 2, and
2 is 4, which set on the right side of a
cross, thus + 4

Then cast away the nines of the Mul-
tiplier, saying, 4 and 8 is 12, cast away
the nine, and there remains 3, which
place on the left side thus 3+4; then
multiply the one by the other, saying, 3
times 4 is 12, cast away nine, and there
remains 3, which place at the top of the
cross, thus, 3

3+4.

Lastly cast away the nines of the pro-
duct, saying, 1 and 7 is 8, and eight is 16,
cast away nine, and there remains 7; then
7 and 1 is 8, and 7 is 15, cast away nine
and there remains 6; then 6 and 6 is 12,
cast away nine, and there remains 3, which
place at the bottom of the cross, and if the
top figure and the bottom be alike, your
work may be true.

This is the common way to prove Mul-
tiplication; But the most certain proof

30 *Multiplication* Chap. 4
 is by Division, as hereafter I shall shew
 you.

II. Yet for the more perfect understanding of Multiplication, I have here laid it down in the nature of the *Golden Rule*, which though it be not according to the usual method of Teaching, yet the experience I have had thereof, sheweth me, that it wil inform any one more thoroughly in the Nature of this Rule, than any directions I have yet read ; for tryal hereof take sundry Examples, wrought onely by multiplying second and third numbers together, as these following.

Example.

If 1 yard cost 17 d. what cost 40 yards?

17
 —

280

40
 —

facit

680 d.

If 1 pound cost 19 d. what cost 112 lb.

19

1008

112
 —

facit 2128 d.

2.4 Chap. 4. Multiplication. 31

new If 1 shilling make 12 d. what will 20 s.
make? 20

facit 240 d.

If 1 s. make 48 qrs. what will 20 s.

20

facit 960 farthings.

If 1 crown be 60 d. what 500 crowns?

60

3000 d.

If 1 yard be 16 nails, what 576 yards?

16

2256

376

facit 6016 nails.

If 1 Ell Eng. make 20 na. what 246 Ells?

20

facit 4920 na.

If 1 gallon make 8 pints, what 63 gal.

8

facit 504 pints.

If 1 hogsh. make 63 gal. what 4. hogsh.

4

facit 252 gal.

C. 4.

H

If 1 tun make 252 gallons, what 20 tun
20

facit 5040 gallons.

If 1 inch be 3 barley corns, what 12
inches?

facit 36

If 1 foot be 12 inches, what 376 feet
12

facit 4512

If 1 yard be 3 feet, what 478 yards?
3

facit 1434

If 1 furlong be 40 poles, what 846 fur
longs?
40

facit 33840

If 1 mile be 8 furlongs, what 100 miles
8

facit 800

If 1 pound be 12 ounces, what 176 lb?
12

facit 2112

0.4 Chap. 4. Multiplication. 33

tun If 1 ounce be 20 penny weight, what 12
ounces ? 20

—
facit 240

t 12 If 1 penny weight be 24 grains, what 20
penny weight ? 20

—
facit 480

et 30 If 1 pound be 16 ounces, what 112
pounds ? 16

—
672

112

—
facit 1792

fur If 1 quarter be 28 pound, what 4 qrs
4

—
facit 112

iles If 1 C. be 112 pound, what 20 C.
20

—
facit 2240

61? If 1 Tun be 20 C. what 846 Tuns ?
20

—
facit 16920

C 5

If 1 C. grosse alloweth 15 pound tare
what will 72 C. gross?

15

—

360

72

—

facit 180 tare.

If 1 C. grosse give 13 pound tare
what will 96 C. gross give?

13

—

288

96

—

facit 1248

If 1 Doller be 56 d. what 500 Dollers

56

—

3000

2800

—

facit 28000 pence

If 1 French Crown be 6 s. what 866?

6

—

facit 5196

If 1 l. cost 37 d. what cost 475 l.

37

3325

1425

facit

17575 d.

CHAP. V.

D I V I S I O N.

Division is that by which we know how many times a lesser sum is contained in a greater.

The Parts of Division.

In Division observe, $\left\{ \begin{array}{l} 1. \text{ The Dividend.} \\ 2. \text{ The Divisor.} \\ 3. \text{ The Quotient.} \\ 4. \text{ The Remainder.} \end{array} \right.$

1. The *Dividend* is the Sum to be divided.

2. The *Divisor* is the sum by which we divide.

3. The *Quotient* is the Sum produced, and containeth so many times the Divisor, as it self is in value.

4. The

4. The *Remain* is always less than the *Divisor*.

First, Set down the dividend, and right under it towards the left hand the *Divisor*.

Example.

Being to divide 4648 half-pence by 2, the number of half-pence in a penny.

I first set down the Dividend, and then the Divisor under the last figure thus :

4648 (

2

But if the figure or figures just over the Divisor, be lesser than the figures under it, the Divisor must be removed, one degree or place more towards the right hand.

Example.

I would divide 4648 farthings by 48, the number of farthings in a shilling, then I must set my Divisor, thus ;

4648 (

48

And at the end of the two numbers, make a crooked line wherein to include the Quotient, thus (

Yet before you begin your work, consider three things, viz.

1. Seek how often the Divisor is contained in the Dividend.

2. Multiply the Quotient and Divisor together.

3. Sub-

3. *Subtract the Product from the Dividend.*

To propound then the former Example:
In 4648 halfpence, if I would know how many pence.

$$\begin{array}{r} 4648 \quad (2 \\ 2 \end{array}$$

I must seek how many times 2 is contained in 4, which is twice; then I set 2 in the Quotient, and multiply it by the Divisor, saying, 2 times 2 is 4; now 4 from 4, and there remains nothing: which 2 having performed its first office, I cancel with a dash of the pen, and remove it one place nearer the right hand, thus;

$$\begin{array}{r} 4648 \quad (23 \\ 22 \end{array}$$

Then I say again, how many times 2 in 6? which is 3 times; I set down 3 in the Quotient, and multiply it by 2, saying, 3 times 2 is 6; now 6 from 6, and there remains 0.

Again, I remove the Divisor, thus;

$$\begin{array}{r} 4648 \quad (23 \\ 222 \end{array}$$

Thus

Thus, and try how many times 2 in 4, which is two times, therefore I set 2 in the *Quotient*, and multiply it by 2 (the Divisor) saying, 2 times 2 is 4, now 4 from 4, and there remains 0.

$$\begin{array}{r} 4648 \quad (232 \\ 222 \end{array}$$

Again I remove the Divisor, and try again how often 2 is contained in 8, which is 4 times, I set 4 in the *Quotient*, and multiply it by 2, saying, 4 times 2 is 8, now 8 from 8, and there remains 0.

$$\begin{array}{r} 4648 \quad (2324 \\ 2222 \end{array}$$

Another Example with one Figure.

Suppose there is 398 pound to be equally divided between 6 men, the demand is, what each man must have?

First, I set down the Dividend 398, and 6 (the Divisor) under 9 thus, because I cannot take 6 out of 3.

$$\begin{array}{r} 398 \quad (6 \\ 6 \end{array}$$

Then I try how many times 6 I can have in 39, which is 6 times, I place 6

Chap. in the saying and over Divi

Ag place 6 I c I set is 36 which thus

So 21. and will 6 sh 7 gure figur of th

in the Quotient beyond the crooked line, saying, 6 times 6 is 36; now 36 from 39, and there remains 3, which I set down over the 9, and cancel the 39 and 6, my Divisor, thus;

$$\begin{array}{r} 3 \\ 398 \overline{)6} \\ 6 \end{array}$$

Again, I remove my Divisor to the next place under 8, and seek how many times 6 I can have in 38, which is also 6 times, I set 6 in the Quotient, saying, 6 times 6 is 36, 36 from 38, and there remains 2, which 2 I set over the 8, and cancel my 6, thus;

$$\begin{array}{r} 3 \quad 2 \\ 398 \overline{)66} \\ 66 \end{array}$$

So that every man must have 66 l. and 2 l. over, which I may turn into pence, and divide also by 6, and the Quotient will be 80 pence, which is in all 66 pound 6 shillings and 8 pence a piece.

This Order I observe to divide by one Figure; but if the Divisor do consist of more figures then one, I must take the first figure of the Divisor no oftner out of the Dividend than

then I can also take all the rest of the Divisors out of the Dividend that stands above them, as in the Examples following may appear.

But before you proceed to divide by 2 Figures or more, be careful to understand well how to divide by one.

How to prove Multiplication.

In Multiplication I told you, that the most certain proof of that Rule, was by Division; I shall therefore take the Product of one of the Multiplications before going, and divide it by the Multiplier thereof, to try the former work: as for example.

I would divide 178176 by 48, which was one of the former Products in Multiplication, which numbers place as in the Example following.

$$\begin{array}{r} 178176 \\ 48 \end{array}$$

First I seek how many times 4 is contained in 17, which I find 4 times; now 4 times 4 is 16; 16 from 17, and there remains 1, which make the 8 to be but 18; now 4 times 8 is 32; 32 from 18 I cannot, therefore 4 times is too much.

2. I seek whether 3 times will do it, saying; 3 times 4 is 12; now 12 from 17, and there remains 5, which make the 8 to be 58; then I say, 3 times 8 is 24: now 24 from 58, and there remains 4, then 2 that I carried from 5, and there remains 3.

$$\begin{array}{r} 3 \\ \times 4 \\ \hline 12 \\ 178176 \end{array} \quad (3$$

3. I remove the Divisor one place nearer the right hand, saying, how many times 4 in 34? which is 7 times (because 9 or 8 times are too many) then 7 times 4 is 28; now 28 from 34, and there remains 6: then 7 times 8 is 56; 6 from 1 I cannot, but 6 from 11, and there remains 5; then 5 I carried and 1 I borrowed is 6, now 6 from 6, and there remains nothing.

$$\begin{array}{r} 36 \\ \times 45 \\ \hline 180 \\ 178176 \end{array} \quad (37$$

Again, I remove the Divisor, saying, how

how many times 4 in 5 ? which is once ; then I say once 4 is 4. Now 4 from 5 and there remains 1. Then once 8 is 8 ; now 8 from 17, and there remains 9.

$$\begin{array}{r}
 \cancel{8} \cancel{6} \cancel{x} \quad (9 \\
 \cancel{8} \cancel{4} \cancel{8} 9 \quad (6 \\
 \cancel{x} \cancel{7} \cancel{8} \cancel{x} \cancel{7} 6 \quad (371 \\
 \cancel{4} \cancel{8} \cancel{8} \cancel{8} \\
 \cancel{4} \cancel{4}
 \end{array}$$

Again I remove the Divisor, and seek how many times 4 is in 9, which is twice, saying, 2 times 4 is 8 ; now 8 from 9, and there remains 1. Then 2 times 8 is 16 ; now 16 from 16, and there remains nothing. So that I find the Quotient to be 3712, the same as the Multiplicand was in the Multiplication, which is a most certain proof of that Rule.

How to prove Division.

$$\begin{array}{r}
 \cancel{8} \cancel{6} \cancel{x} \cancel{x} \\
 \cancel{8} \cancel{4} \cancel{8} 9 \quad (3712 \\
 \cancel{x} \cancel{7} \cancel{8} \cancel{x} \cancel{7} 6 \quad 48 \\
 \cancel{4} \cancel{8} \cancel{8} \cancel{8} 8 \quad 29696 \\
 \cancel{4} \cancel{4} \cancel{4} \quad 14848 \\
 \hline
 \text{Proof.} \quad 178176
 \end{array}$$

And

And as Division is a sure proof of Multiplication, so Multiplication is the surest proof of Division, which is performed by multiplying the Quotient with the Divisor; and if the Product thereof be the same with the Dividend, your Division is well wrought, otherwise be sure some error is committed in your work.

Also if any figures remain after your Division is ended, they must be added into the Product of your Multiplication, according to their several places, and then (if true) the Total will be likewise the same with the Dividend; as for example both appear in the last sum of this Rule.

A more easier way of Division, and with fewer figures.

There are 4648 shillings to be equally divided betwixt 34 men: I demand what is each mans proportion?

I will not stand to shew you more of this common way of Division, which is indeed very tedious & burdensome to the memory, and hath caused (to my knowledge) many to despair of attaining it, and so of pro-

proceeding further in this Art. But proceed by the Method following, which will enable one to go on with far more ease and delight than commonly is seen.

The Question being stated, is to be solved thus ;

$$4684 \text{ (}$$

$$34$$

Wherein consider how often 34 is contained in 46 ; which is once (or rather see first how often 3 is contained in 4 which is likewise once) then set 1 in the Quotient, saying, once 4 is 4 : now 4 from 6, and there remains 2; which 2 set directly over its Dividend.

$$12$$

$$4684 \text{ (1}$$

$$34$$

Then go backward to the next, saying once 3 is 3, 3 from 4 and there remains 1 which also set over the 4, and cancel it and 3 the Divisor, with a dash of the Pen as you see in the Example.

Then remove the Divisors one degree farther towards the right hand, thus ;

$$12$$

$$4684 \text{ (1}$$

$$34$$

$$3$$

Then

Then consider how often 3 is contained in 12, which is 4 times: but 4 times the next Divisor cannot be taken out of 8; and you must never take one of the Divisors oftner than you can take all the rest: seeing then 4 times is too much, try (in your mind) whether each Divisor can be taken 3 times; if so, then place 3 in the Quotient, saying, 3 times 4 is 12; 12 from 8 I cannot, but 12 from 18 and there remains 6. Then 3 times 3 is 9, and 1 that I carried is 10, 10 from 12 and there remains 2.

$$\begin{array}{r} \times 26 \\ \# 684 \quad (13 \\ \# \# \# \\ \# \end{array}$$

Again, remove your Divisor towards your right hand, thus.

$$\begin{array}{r} \times 26 \\ \# 684 \quad (13 \\ \# \# \# 4 \\ \# 3 \end{array}$$

Then consider how often three is contained in 26; which is 8 times; and 8 times 3 is 24; now 24 from 26, and there remains 2, which two will make the next figure to be but 24: Then 8 times 4 is 32: 32 out of 24 cannot be, and

and therefore say 8 times is too much. Which seeing so: try (in your mind) whether 7 will do it, saying 7 times 4 is 28 from 4 I cannot, but 28 from 34, and there remains 6. Then 7 times 3 is 21 and three that I carried is 24; 24 from 26, and there remains 2. Cancel out the Dividend and Divisor, and set the remainder over head, and your work is done.

(2

x 26 (6

4684 (137

3444

38

The Quotient sheweth that 34 men must have 137 shillings a piece, and 2 shillings over and above to be divided amongst them.

Which Remainders, and all others of Division, I shall shew you what they are when you practise Fractions, as the place more convenient and proper.

4. Example.

There is a Ship taken by 346 Sea-men which is valued at 876541. to be equally divided amongst them; I demand what each man must have?

876

$$\begin{array}{r} 87654 \\ 346 \end{array}$$

Consider how many times 346 is contained in 876, which is two times; or rather how often 3 is contained in 8, which is likewise 2 times; set 2 in the Quotient, and say, 2 times 6 is 12: 12 from 6 I cannot, but 12 from 16 and there remains 4.

Then 2 times 4 is 8, and that I borrowed is 9; 9 from 7 I cannot, but 9 from 17, and there remains 8.

Then 2 times 3 is 6, and 1 is 7: 7 from 8, and there remains 1. Then having done with the Divisors, remove them to the next place towards the right hand, thus;

Then say, how many times 3 in 18? 6 times, but that being too much, (because all the rest cannot be taken so often)

therefore say 5 times 6 is 30; 30 from 35 cannot, but 30 from 35 and there remains 5.

Then 5 times 4 is 20, and 3 that I borrowed is 23; 23 from 4 I cannot, but

$$\begin{array}{r} 183 \\ 87654 \quad (2 \\ 346 \end{array}$$

$$\begin{array}{r} 184 \\ 87654 \quad (2 \\ 346 \end{array}$$

but 23 from 24, and there remains 1.

11

$\times 84$

87654 (25

$\times 466$

$\times 4$

Then 5 times 3 is 15, and 2 that I borrowed is 17; 17 from 18, and there remains 1.

Again remove the Divisors (pondering in your mind) how many times 3 can I have in 11? three times: by which I perceive 3 will do it, therefore place it in the Quotient, saying, 3 times 6 is 18; from 4 I cannot, but 18 from 24, and there remains 6. Then 3 times 4 is 12, and 2 that I carried is 14: 14 from 5 cannot, but 14 from 15 and there remains 1. Then 3 times 3 is 9 and 1 that I carried is 10; 10 from 11, and there remains 1.

(1

$\times (1$

$\times 84 (6$

87684 (253

$\times 4666$

$\times 44$

3

5. Example.

There is a City taken in the wars by 9034
souldiers, that is worth 7306242 l. I de-
mand what each Souldier must have?

7306242 (

9034

Here you see that 9034 cannot be con-
tained in 7306, therefore remove your
divisor to the next place toward the right
end, thus;

7306242 (

9034

1. Consider how many times 9 can be
contained in 73, which is 8 times, place 8 in
the Quotient, saying, 8 times 4 is 32, 32
out of 73 I cannot, but 32 out of 73, and
there remains 0.

Then 8 times 3 is 24, and 3 that I bor-
rowed is 27; 27 from 6 I cannot, but 27
from 36, and there remains 9.

Then 8 times 0 is 0, but 3 that I carri-
ed is 3; 3 from 10 and there remains 7.

790

7306242 (8

9034

Then 8 times 9 is 72, and 1 that I bor-
rowed is 73; 73 from 73, and there re-
mains 0.

D

Again remove your Divisor.

Here you also see that 9034 the Divisor, cannot be taken out of the Dividend therefore cancel it, and remove it to the next place, setting a Cypher in the Quotient.

$$\begin{array}{r}
 790 \\
 7806242 \quad (80 \\
 90344 \\
 902
 \end{array}$$

Then try again how often the Divisor is contained in the Dividend, which is times.

Then say 8 times 4 is 32; 32 out of I cannot, but 32 out of 32 and there remains nothing.

Then 8 times 3 is 24, and 3 that I borrowed is 27; 27 from 4 I cannot, but 27 from 34, and there remains 7.

$$\begin{array}{r}
 79070 \\
 7806242 \\
 9034444 \quad (808 \\
 90333 \\
 900
 \end{array}$$

9

Then 8 times 0 is 0; but 3 that I borrowed it 3; 3 from 0 I cannot, but

from 10, and there remains 7.

Then 8 times 9 is 72, and 1 that I borrowed is 73; 73 from 79, and there remains 6. So that every Souldier must have for his share 808 pounds.

6. Example.

What is the Quotient of 56037478 divided by 2306803?

Consider how often the Divisor is contained in the Dividend, which is here twice.

$$\begin{array}{r} 90141 \\ 2306803 \overline{) 56037478} \quad 2 \\ \underline{2306803} \end{array}$$

Then say 2 times 3 is 6, 6 from 7, and here remains 1.

Then 2 times 0 is 0; 0 from 4 and here remains 4.

Then 2 times 8 is 16: 16 from 17 I cannot, but 16 from 17, and there remains

Then 2 times 6 is 12, and 1 that I borrowed is 13: 13 from 3 I cannot, but 13 from 13, and there remains 0.

Then 2 times 0 is 0, but 1 that I borrowed is 1; 1 from 0 I cannot, but 1 from 0, and there remains 9.

D 2

Then

Then 2 times 3 is 6, and 1 that I borrowed is 7; 7 from 6 I cannot, but 7 from 16, and there remains 9.

Then 2 times 2 is 4, and 1 that I borrowed is 5; 5 from 5 and there remains nothing.

Remove the Divisor.

Again, Consider how many times the Divisor is contained in the Dividend which is 4 times.

(67410

890333(6

56037478(14

23068033

230680

Then say, 4 times 3 is 12; 12 from 18 I cannot, but 12 from 18, and there remains 6.

Then 4 times 0 is 0, but 1 that I borrowed is 1; 1 from 1, and there remains 0.

Then 4 times 8 is 32; 32 from 34 I cannot, but 32 from 34, and there remains 2.

Then 4 times 6 is 24, and 3 that I borrowed is 27; 27 from 31 I cannot, but 27 from 31, and there remains 4.

The

Then 4 times 0 is 0, but 3 that I borrowed is 3; 3 from 0 I cannot, but 3 from 10 and there remains 7.

Then 4 times 3 is 12, and 1 that I borrowed is 13; 13 from 9 I cannot, but 13 from 19, and there remains 6.

Then 4 times 2 is 8, and 1 that I borrowed is 9; 9 from 9 and there remains 0. So that the Quotient is 24; or the Divisor is contained in the Dividend 24 times.

Having laid down the latter part of the former Rule, in the nature of the Rule of Three, and apprehending it very necessary for young Learners, I shall therefore observe the same here in Division; which is performed by dividing the second number by the first, and the Quotient is the Answer to the Question.

Example.

If 63 Gallons make 504 pints, what 1 gallon?

504 (8 pints.

63

If 4 hogheads make 252 gallons, what Hoghead?

252 (63 gal.

44

D 3

If 20 Tuns make 5040 Gallons, what
1 Tun?

1

$$\begin{array}{r} 252 \\ 20 \overline{) 5040} \end{array}$$

$$2220$$

If 22 C. gross allow 1080 pound for
tare, what must 1 C allow?

36

$$\begin{array}{r} 15 \text{ lb. facit.} \\ 22 \overline{) 1080} \end{array}$$

$$722$$

7

If 152 C. cost 760 pound, what cost 1 C

$$\begin{array}{r} 5 \text{ lb. facit.} \\ 152 \overline{) 760} \end{array}$$

$$5$$

If 500 dollars be 28000, d. what 1 dollar

3

$$\begin{array}{r} 56 \text{ facit.} \\ 500 \overline{) 28000} \end{array}$$

$$56$$

I shall not (I hope) need to trouble my self
or Learner to shew the working of this sum
any others, having now (as I suppose) suf-
ficiently treated of Division, but will leave
it to the censure of the most experienced
judge, whether this manner of dividing be
plain, lineal, and to be wrought with fewer
Figures than any which is commonly taught
for example appeareth.

(8

97(5

9868(0

987829(3

98784181(0

9878820609(8

987884198987(6

49882714848768(4

2469188786876848(2

123456789987654321(124999999

9876543210987654321

9876543210987654321 975308641

9876543210987654321 249999998

9876543210987654321 374999997

9876543210987654321 499999996

9876543210987654321 624999995

98777 749999994

988 874999993

9 999999992

1124999991

Proof. 123456789987654321

CHAP. VI. REDUCTION.

I. **A**S for Reduction, though it be no Rule absolute of itself, but merely wrought by Multiplication and Division (as I have here manifested in a plain manner) yet I think good (not altogether to omit it, lest any should censure me for so doing, in regard it is very usually practised) to deliver somewhat therefore concerning it.

Reduction teacheth one to bring all gross, or great Denominations into small, and small into great.

First, All great Denominations are brought into small by Multiplication: As
*Pounds multiplied by 20, are shillings.
 Shillings multiplied by 12, are pence.
 Pence multiplied by 2, are halfpence.
 Pence multiplied by 4, are farthings.
 Pounds multiplied by 240, are pence.
 Pounds multiplied by 480, are halfpence.
 Pounds multiplied by 960, are farthings.*

Secondly

Secondly, All small names are brought into great by Division. As,

Shillings divided by 20 are pounds.

Pence divided by 12 are shillings.

Half pence divided by 2 are pence.

Farthings divided by 4 are pence.

Pence divided by 240 are pounds.

Half pence divided by 480 are pounds.

Farthings divided by 960 are pounds.

In 1000 l. how many s. d. and qrs?

20

20000 shillings.

12

240000 pence.

4

960000 farthings.

1. Consider whether the sum propounded be to be brought into a greater or lesser denomination.

2. Consider how many of the one can make the other; as here, how many shillings can make a pound, viz. 20: and contra, how many shillings a pound makes, viz. 20.

D 5

There

Therefore of necessity there must be 20 times so many, which being multiplied by 20, makes 20000 shillings, and by 12 240000 pence, and by 4, *facit* 960000 farthings: as in the Example.

In 960000 farthings, how many pence, shillings and pounds?

$$\begin{array}{r}
 960000 \\
 \times 4 \\
 \hline
 3840000 \\
 \times 12 \\
 \hline
 46080000 \\
 \times 20 \\
 \hline
 921600000
 \end{array}$$

facit 1000000

To bring shillings into pounds, cut off the first figure towards the the right hand with a dash of the pen, and take half of the remaining figures.

In 8471213 farthings, how many pence, groats and nobles?

$$\begin{array}{r}
 8471213 \\
 \times 4 \\
 \hline
 33884852 \\
 \times 12 \\
 \hline
 406618224 \\
 \times 20 \\
 \hline
 8132364480
 \end{array}$$

facit (26472 nobles.

Here

Here you see the sum is to be brought into a greater Denomination than it self, which is therefore to be done by Division.

Then you are to consider what your Divisor must be, which is here 4, because 4 farthings make a penny; and as often as 4 is contained in the said sum, so many pence there are.

Your farthings thence being brought into pence, consider the next denomination what it is, and how many of the former make one of it; as how many pence make a groat, viz. 4; and look how many times 4 is contained in the sum, so many groats there are.

Having brought the pence thus into groats, endeavour to bring them into nobles by considering how many groats make a noble, viz. 20. Therefore divide by 20, and your Quotient will be Nobles.

I shall say no more as to Reduction of money, only leave two or three Questions for the Learner to practise upon.

In 100 *l.* how many *qrs. s. d. 3d. & 9d.*

In 47162 marks, how many nobles, pounds, groats, farthings, 6d. and 2d.

In 7865 l. 11 s. 10 d. how many shillings, pence, and pounds, farthings, crowns and ob.

Reduction of Cloth-Measure.

II. Observe in this and all the Reductions following, how many of the one Denomination do make one of the other, and so multiply or divide according to the two Rules aforesaid in Reduction of Money.

In 4372 yds. how many qrs & els Flem.

4

17488 qrs.

22 (1 ell Flem.

17488 (5829 facit $\frac{1}{3}$

8888

In 7864 els Eng. how many qrs. & yds.?

5

39310 qrs.

22 (2 yrs.

39310 (9827

4444

In 85 pieces, each 19 Ells $\frac{3}{4}$, how many quarters, nails, and yards?

Rg-

Reduction of Wine Measure.

III. In 35 tuns how many hogheads, gallons, pottles, quarts and pints?

$$\begin{array}{r}
 35 \\
 4 \\
 \hline
 140 \text{ hogsh.} \\
 63 \\
 \hline
 420 \\
 840 \\
 \hline
 8820 \text{ gallons.} \\
 4 \\
 \hline
 35280 \text{ quarts} \\
 2 \\
 \hline
 70560 \text{ pints.}
 \end{array}$$



In 4712568 pints, how many gallons and Rundlets, each 11 gallons?

In 327 Barrels, each 32 gallons, how many hogheads and tuns?

Reduction of Time.

IV. In 1659 years } 365 dayes a year.
 how many dayes, hours } 24 hours a day.
 and minutes ? } 60 min. an hour.

$$\begin{array}{r}
 1659 \\
 365 \\
 \hline
 8295 \\
 9954 \\
 4977 \\
 \hline
 606535 \text{ dayes.} \\
 24 \\
 \hline
 2426140 \\
 1213070 \\
 \hline
 14556840 \text{ hours.} \\
 60 \\
 \hline
 87340400 \text{ minutes.}
 \end{array}$$

In 87167155 Minutes, how many hours,
 dayes and years ?

In 20 years and $\frac{1}{2}$ how many dayes,
 hours and minytes ?

Re.

Reduction of Land Measure.

V. In 100 miles how many furlongs, poles, feet, inches, and barley corns?

8 furlongs
a mile.
40 poles a
furlong.

100 miles } 16 $\frac{1}{2}$ feet a pole.
8 } 3 feet a yard.
— } 12 inches a foot.
800 furlongs } 3 Barley corns an
40 } inch.

32000 poles.

33

96000

96000

1056000 half feet.

528000 feet.

12

6336000 inches.

3

19008000 barley corns.

Reduction of Troy Weight.

VI. In 87 pound and $\frac{1}{2}$ how many ounces, penny weight, and grains?

87 lb and $\frac{1}{2}$

12

174

876

1050 03

20

21000 dw.

24

84000

42000

504000 grains.

In 7151213 grains, how many penny weight, ounces and pounds?

In 15 Ingots, each 7 pound and $\frac{1}{2}$, how many ounces, penny weight and grains?

Re

In
and C

Reduction of Haverdupoize Weight.

VII. In 96 C. weight, how many *grs.*

(lb and $\frac{3}{4}$?)

$$\begin{array}{r} 4 \\ \hline 384 \text{ grs.} \\ 28 \end{array}$$

$$\begin{array}{r} 3072 \\ 768 \end{array}$$

$$\begin{array}{r} 10752 \text{ pounds} \\ 16 \end{array}$$

$$\begin{array}{r} 64512 \\ 10752 \end{array}$$

172032 ounces

In 40 C $\frac{1}{2}$ 19 pound 11 ounces, how

(many *grs.* lb. and $\frac{3}{4}$?)

$$\begin{array}{r} 4 \\ \hline 162 \text{ grs.} \\ 28 \end{array}$$

$$\begin{array}{r} 1305 \\ 325 \end{array}$$

$$\begin{array}{r} 4555 \text{ lb.} \\ 16 \end{array}$$

$$27331$$

$$4556$$

$$72891 \frac{3}{4}$$

In 8714 ounces, how many pounds, *grs.*
and C? In

In 20 Bags, each 3 C. $\frac{1}{2}$, how many qrs. and pounds?

$$\begin{array}{r}
 4 \\
 \hline
 14 \\
 28 \\
 \hline
 112 \\
 28 \\
 \hline
 392 \text{ pounds in one.} \\
 20 \\
 \hline
 \end{array}$$

7840 pounds in all.

Where you find the word [each] have a special regard to it, and reduce the particulars which it implieth, first into one Denomination then when you know how much is contained in one, you may easily know how much is in all.

In 36 Barrels of Figs, each 3 C. $\frac{1}{4}$ gross, tare 19 pound per Barrel, how many pounds neat?

Whether the word Tare imply per Bag, per Barrel, or per C. &c. it is all as one, if you keep to your former Rule in Multiplication, by observing which you cannot miss of what you would know: as here Tare 19 pounds per Barrel.

Say, if 1 Barrel give 19 pounds, what 36 Barrels?

Multi-

grs. Multiply 19 and 36 together, and the Product is pounds Tare, then subtract the pounds Tare from the pounds gross, and the remains are pounds Neat.

$$\begin{array}{r} C. \\ 3\frac{1}{4} \\ 4 \end{array}$$

$$\begin{array}{r} 13 \\ 28 \end{array}$$

$$\begin{array}{r} 104 \\ 26 \end{array}$$

$$\begin{array}{r} 364 \text{ pounds in} \\ 36 \text{ (one barrel.)} \end{array}$$

$$\begin{array}{r} 2184 \\ 1092 \end{array}$$

$$\begin{array}{r} 13104 \text{ pounds gross} \\ 684 \text{ pounds tare.} \end{array}$$

$$12420 \text{ pounds neat}$$

In 45 Bags of, &c. each 17 C. $\frac{1}{2}$ gross, tare 15 pounds per Bag, how many C. neat?

In 47 C. $\frac{1}{2}$ grosse, tare 17 pounds per C. how many pounds neat?

In

In 26 Bags, each 3 C. $\frac{1}{2}$, how many qrs. and pounds?

$$\begin{array}{r} 4 \\ \hline \end{array}$$

$$\begin{array}{r} 14 \\ 28 \\ \hline \end{array}$$

$$\begin{array}{r} 112 \\ 28 \\ \hline \end{array}$$

$$\begin{array}{r} 392 \text{ pounds in one.} \\ 20 \\ \hline \end{array}$$

7840 pounds in all.

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Say, if 1 Barrel give 19 pounds, what 36 Barrels?

Multi-

Multiply 19 and 36 together, and the Product is pounds Tare, then subtract the pounds Tare from the pounds gross, and the remains are pounds Neat.

C.

$3\frac{1}{4}$

4

13

28

104

26

364 pounds in
36 (one barrel.

2184

1092

13104 pounds gross
684 pounds tare.

12420 pounds neat.

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In 47 C. $\frac{1}{2}$ grosse, tare 17 pounds per C. how many pounds neat?

In

In 5 hogsheads of Tobacco, each containing as followeth, viz. how many C. near?

		C. qrs. lb.	lb.
Number	1	4 - 2 - 11	tare 63
	2	3 - 1 - 12	tare 72
	3	2 - 3 - 16	tare 56
	4	4 - 1 - 20	tare 75
	5	3 - 2 - 27	tare 64

In 57120 C. $\frac{1}{2}$ of Lead, how many Fother, at 19 C. $\frac{1}{2}$?

In 5672 Pigs of Lead, each 7 C. $\frac{1}{2}$, how many Fother at 19 C. $\frac{1}{2}$?

Facit, 2181 Fother $\frac{1}{2}$.

CHAP. VII.

Numeration of Fractions.

THe next things to be treated of, are Fractions.

1. Concerning which, I shall shew what a Fraction is.
2. How it is exprest.
3. How many sorts of Fractions there are.

7. Chap. 7. Numeration of Fractions. 69

on. C. A Fraction, or broken number, is a part or many parts of a whole number. For as whole Numbers take their beginning from one, and continue in number without end; so the said whole numbers by imagination, may be dissolved or broken into pieces or parts infinite.

Therefore to attain the knowledge of them, acquaint your self with these two terms, Numerator and Denominator.

The Numerator expresseth the number of the parts.

The Denominator giveth to those parts their names.

$\frac{1}{2}$ $\frac{2}{3}$ $\frac{3}{4}$ Numerator.
Denominator.

Proper Fractions. $\left\{ \begin{array}{l} \frac{1}{2} \text{ is the one half of any thing.} \\ \frac{2}{3} \text{ is two third parts of any thing.} \\ \frac{3}{4} \text{ is three quarters of any thing.} \\ \frac{4}{5} \text{ is four five parts of any thing.} \end{array} \right.$

Fractions of Fractions.

Fractions of Fractions have commonly this word [of] between them, as $\frac{2}{3}$ of $\frac{3}{4}$ that is, two thirds of three quarters.

Improper Fractions. { If the *Numerator* be greater than the *Denominator*, the Fraction is improper, and containeth a Unite or Unites, or some part or parts of the *Denominator*, as $\frac{15}{4}$ is three Integers, or wholes, and three *grs.*

But when the *Numerator* and the *Denominator* are alike, they make a Unite.

Though *Addition* in whole *Numbers*, be immediately after *Numeration*, yet in *Fractions* it is not so, because there are as here you see, *Fractions* of several sorts, which must of necessity be reduced into 1 Denomination, before they can be added. Therefore to avoid disorder, I shall first shew what this Reduction of *Fractions* is; secondly, how to reduce all *Fractions* to one denomination or likeness

CHAP. VIII.

Reduction of Fractions.

What Reduction is { *Reduction* teacheth to bring Integers into *Fractions*, or contrary; yea, *Fractions* of divers denominations into one, or what you list.

12 16
 $\frac{1}{2}$ $\frac{2}{3}$
 24

Chap. 8. *Reduction of Fractions.* 71

I would have reduced $\frac{1}{2}, \frac{2}{3}, \frac{3}{4}$, of an ell, or what you please into one denomination.

To reduce proper Fractions.

For the effecting of this, and all others of this kind, multiply all the Denominators together (which Product take for a common Denominator) as 2 times 3 is 6, and 4 times 6 is 24, your denominator.

2. Then multiply the Numerator of the first in all the other Denominators, except its own Denominator; as once 3 is 3: 3 times 4 is 12, which take from a new Numerator to the first Fraction.

Then multiply the second Numerator in all the Denominators, except its own; as 2 times 2 is 4, and 4 times 4 is 16, which likewise take for a new Numerator to the second.

Then multiply the third Numerator in all the Denominators, except its own; as 3 times 3 is 9, 2 times 9 is 18, which also place for a new Numerator to the third, and your work standeth thus:

$$\begin{array}{r} 12 \quad 16 \quad 18 \quad \text{So that} \quad \frac{12}{24} \cdot \frac{16}{24} \cdot \frac{18}{24} \\ \hline \frac{1}{2} \quad \frac{2}{3} \quad \frac{3}{4} \quad \text{are equal to} \quad \frac{1}{2} \cdot \frac{2}{3} \cdot \frac{3}{4} \\ 24 \end{array}$$

II. To

*II. To reduce Fractions of Fractions
into one Denomination.*

Multiply all the Numerators together, and take the Product thereof for a new Numerator, and likewise multiply all the Denominators together, and make the Total a Denominator.

6

Example. $\frac{1}{2}$ of $\frac{1}{3}$ of $\frac{1}{4}$

24

*III. To Reduce improper Fractions
into whole numbers.*

Divide the Numerator by the Denominator

Example. $\frac{21}{4}$ $\frac{3}{1}$
28 (5 $\frac{3}{4}$

#

*IV. To reduce a whole number into an
improper Fraction.*

Let the number given be the Numerator, and 1 the Denominator.

Example. Reduce 13 Integers into an improper Fraction. *facit* $\frac{13}{1}$

V. To

10. *To reduce a whole Number joyned with a Fraction into one Denomination.*

Multiply the whole Number into the Denominator of the Fraction, adding thereto the Numerator.

Example. 5 yards and $\frac{3}{4}$ facit $5\frac{3}{4}$

11. *To reduce a greater Fraction into lesser terms equivaluable to it self.*

Take the half of the Numerator, and half of the Denominator, as oft as you can, and when you can take the half no further, take the one third, or the one fourth, or the one fifth, &c. both of the Numerator and the Denominator.

Example.

I would abreviate $\frac{24}{120} | \frac{12}{60} | \frac{6}{30} | \frac{3}{15} | \frac{1}{5}$

Take the half of 24, which is 12, then the half of 120, which is 60; again the half of 12, which is 6, and the half of 60 is 30; then the half of 6 is 3, and the half of 30 is 15: here you see that the half cannot be taken both of the Numerator and Denominator, therefore try whether it will be abreviated by 3, as thus; How many

74 *Reduction of Fractions.* Chap. 8.

many times 3 in 3, once; then how many times 3 in 15, five times. So that $\frac{1}{3}$ is in the lowest Denomination, yet it retains the same value; for $\frac{1}{3}$ is equal to $\frac{4}{12}$.

A second kind of Abbreviation.

Though by the former Rule all Fractions might be abbreviated, yet when you cannot take $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, or $\frac{1}{9}$, &c. they seem more tedious than by this second way, as may appear.

I would have this sum abbreviated, $\frac{3077}{2181}$ into a lesser Fraction.

For the reducing whereof, divide then the Denominator by the Numerator, and the remain of the Division will be 1086, by which divide the former Divisor 3077, and there will remain 905, by which divide your last Divisor 1086, and there will remain 181, by which Remain likewise divide the Divisor 905, and there will remain 0.

Where note, that having divided your Denominator by your Numerator, and the Divisor of every Division so often by the Remains, that nothing will remain; Then that last Divisor will divide both your Numerator and Denominator of your Fraction.

on.

Chap. D. Reduction of Fractions. 25

on. As in the Example.

$\frac{30}{41} \frac{77}{83}$ facit, $\frac{17}{11}$ equal to the former.

How to reduce or alter any Fraction to another Denomination, as Money, Weight, or Measure, &c.

Multiply the Numerator by such a new Denominator or number which you intend, dividing the Product by the former Fraction's Denominator, whose Quotient shall be Numerator to the Denominator last chosen.

Examples.

What is $\frac{2}{3}$ of 12 d.

$\frac{2}{3}$

24 (8 d. facit.

What is $\frac{1}{5}$ of 20 shillings?

What is $\frac{2}{3}$ of a Flem. Ell?

What is $\frac{1}{2}$ of a yard?

What is the $\frac{1}{8}$ of a Tun of Wine.

What is the $\frac{6}{7}$ part of a Tun of Iron.

What is the $\frac{2}{5}$ part of a hoghead of Sack.

What $\frac{4}{5}$ of a Dollar at 4 s. 8. d.

facit 44 d. $\frac{4}{5}$.

6

What is the $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ of 5 shillings.

24

E 2

Reduce

Reduce Fractions of Fractions to one single Fraction, and work as before.

$$\begin{array}{r} 6 \mid 3 \mid 1 \text{ of } 8 \mid 1 \text{ s. } 8 \text{ d.} \\ \hline 24 \mid 12 \mid 4 \quad \# \end{array}$$

What is $\frac{4}{3}$ of a Dollar at 4s, 8d?

facit, 44 d. $\frac{4}{3}$.

CHAP. IX.

Addition of Fractions.

Addition of Fractions is the putting of two or more broken numbers into one sum, or principal Fraction.

In this Rule and the next, observe, that all Fractions, whether proper or improper, must be of one Denomination, or reduced thereto by the former Rules.

2. Being of one Denomination only, add all the Numerators together, which Total subscribe for a new Numerator over the Common Denominator.

Example.

Add $\frac{2}{3}$ and $\frac{1}{3}$ of any thing together.

$\frac{2}{3}$ and $\frac{1}{3}$ *facit* $\frac{3}{3}$, or one whole one.

326

$$\begin{array}{r}
 326 \\
 \hline
 60 \ 80 \ 90 \ 96 \\
 \text{Add } \frac{1}{2} \ \frac{2}{3} \ \frac{3}{4} \ \& \ \frac{4}{5} \text{ together; facit } \frac{120}{120}
 \end{array}$$

Reduce them into one Denomination by the first Rule of Reduction, then add the Numerators ; as in the last Example.

A more speedy way.

Multiply all the Denominators that differ in quantity each from other, and the total thereof shall be the common Denominator, and Dividend to each particular Denominator, whose Quotient multiply into its Numerator, and set it directly against its own Fraction ; and, *in fine*, add them all up, which total shall be new Numerator unto the common Denominator; and add as many Integers as they make to the whole Numbers.

Example lb. (24) or 12

$$\begin{array}{r}
 630 - \frac{1}{4} 3 \\
 271 - \frac{1}{2} 6 \\
 103 - \frac{1}{3} 4 \\
 017 - \frac{3}{4} 9 \\
 710 - \frac{1}{2} 6 \\
 \hline
 1733 \frac{118}{12}
 \end{array}$$

E 3

III.

III. Yet a more short way.

Cast your eye upon the Denominators, and imagine what number will be divided by them all, and that shall be your common Denominator and Dividend unto each particular Denominator; then work as before in the last Examples. (12)

$$\begin{array}{r}
 472 - \frac{1}{2} 8 \\
 315 - \frac{1}{3} 9 \\
 \text{Number 12 will be} \quad 917 - \frac{1}{6} 6 \\
 \text{divided by all the} \quad 106 - \frac{1}{8} 8 \\
 \text{Denominators.} \quad 371 - \frac{1}{8} 8 \\
 \quad \quad \quad 125 - \frac{1}{4} 3 \\
 \hline
 2208 - \frac{1}{6} \frac{1}{3} \frac{1}{2}
 \end{array}$$

IV. Addition of Fractions of Fractions.

Ruduce your fractions into a single fraction according to the second Rule in Reduction, then work as before.

Exam. Add $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$ unto $\frac{4}{5}$ of $\frac{5}{7}$.

$$\begin{array}{r}
 6 \quad 24 \quad 210 \quad 576 \\
 \hline
 \frac{1}{2} \text{ of } \frac{2}{3} \text{ of } \frac{3}{4} \quad \frac{4}{5} \text{ of } \frac{5}{7} \quad \frac{25}{34} \quad \frac{24}{5} \quad \frac{210}{789} \\
 \hline
 24 \quad 35 \quad 840 \quad \text{facit } \frac{286}{840}
 \end{array}$$

V. Ad.

V. Addition of improper Fractions.

Reduce your Fractions into one Denomination, and work as *supra*.

Example. Add $\frac{5}{8}$ and $\frac{7}{8}$

$$\begin{array}{r} 58 \\ \hline 30 \quad 28 \\ \hline \frac{5}{8} \quad \frac{7}{8} \quad \text{facit } \frac{12}{8} \\ 24 \end{array}$$

VI. To add a single Fraction unto a Fraction of Fractions.

Example. Add $\frac{1}{2}$ and $\frac{1}{3}$ of $\frac{4}{5}$ together; of $\frac{4}{5}$ reduce into a single Fraction, according to the second Section, in page 72. and work as before.

$$\begin{array}{r} 4 \\ \hline \frac{1}{2} \text{ of } \frac{4}{5} \\ 15 \end{array} \quad \begin{array}{r} 61 \\ \hline 16 \quad 45 \\ \hline \frac{4}{15} \text{ and } \frac{1}{2} \quad \text{facit } \frac{21}{30} \\ 60 \end{array}$$

C H A P. X.

Subtraction of Fractions.

I. Subtraction is the taking of one Fraction from another, a less from

a greater, or an equal from an equal.

1. Because Subtraction teacheth to take a lesser Fraction from a greater, it will not be amiss to shew you how to know the one from the other.

2. Those Fractions are accounted the greatest, whose Numerator multiplied by the Denominator of the others Fraction, maketh the greatest number.

And as in Addition, so here, all Fractions to be subtracted, must be of one Denomination, or reduced thereunto.

II. To subtract Fractions of one Denomination.

Subtract one Numerator from the other, and set the Remain over the common Denominator. *Example.*

Subtract $\frac{2}{3}$ from $\frac{3}{3}$, remain $\frac{1}{3}$.

III. To subtract a whole Number and a Fraction from a whole Number and a Fraction

First reduce your Fractions into one Denomination, then subtract the one Numerator from the other; and for the Integers, subtract as you were taught in whole numbers. *Example.*

Received 30 l. $\frac{3}{4}$. Laid out 10 l. $\frac{1}{2}$.

$$\begin{array}{r}
 2 \\
 \hline
 6 \quad 4 \\
 \frac{3}{4} \quad \frac{1}{2} \text{ Remain } \frac{1}{4} \text{ or } \frac{2}{4} \\
 \hline
 8
 \end{array}$$

IV. Another way.

Multiply the Denominators together, and let the Product be the common Denominator, which common Denominator divide by each particular Denominator, and multiply their Quotients by their Numerators, and set down their Products directly against its Fraction, and then subtract, as if it were in whole numbers.

As for example.

Received 100 l. $\frac{5}{8}$ 25
 Spent ——— 93 l. $\frac{1}{3}$ 18.

Remains — 07 l. $-\frac{7}{24}$

V. When the Fraction to be subtracted, is greater than the Fraction you are to subtract from.

Reduce them into one common Denominator (as you did in the last example) and subtract the greatest Numerator from the common Denominator, and add the Remains to the Numerator of the less,

E 5. which

82 Subtraction of Fractions. Chap. 10

which subscribe for new Numerator unto the common Denominator, then carry one to the next Integer, and subtract as in whole numbers.

l. s.		C.	
Received	5 - 0	Bought	16 $\frac{1}{2}$ 7
Paid	— 3 - $\frac{2}{5}$	Sold	— 14 $\frac{3}{7}$ 12
Remains	— 1 - $\frac{3}{5}$	Remain	01 $\frac{23}{28}$

VI. When Fractions of Fractions are to be subtracted, they must be reduced into single Fractions, then subtract as before.

Example. $\frac{1}{2}$ of $\frac{2}{3}$ to be subtracted from $\frac{3}{4}$ of $\frac{1}{5}$, being reduced in single Fractions, they are $\frac{1}{5}$ and $\frac{2}{15}$.

$$\begin{array}{r}
 4 \\
 \hline
 5 \ 9 \\
 \hline
 \frac{1}{5} \ \frac{3}{5} \\
 \hline
 15
 \end{array}
 \quad \text{Remain } \frac{4}{15}$$

CHAP. XI.

Multiplication of Fractions.

IN Multiplication of Fractions, whether they be proper, improper, mixt or compound, they must likewise be reduced to single Fractions; multiply the Numerators therefore together, and the Product shall be a new Numerator: then multiply all the Denominators, and the Product thereof shall be Denominator.

Chap. 11

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Chap. II. *Multipl. of Fractions.* 83

Example.

Multiply $\frac{2}{3}$ by $\frac{1}{2}$ $\frac{2}{3} \times \frac{1}{2}$ facit $\frac{1}{3}$ or $\frac{1}{3}$.

12

It might seem (somewhat) strange to young Learners, that $\frac{2}{3}$ of a pound being multiplied by $\frac{1}{2}$ of a pound, should make but $\frac{1}{3}$: Therefore to inform them, I think meet to acquaint them, that as whole Numbers multiplied by whole Numbers, do increase the Product, so proper Fractions multiplied by proper Fractions, do diminish the Product: for as 1 multiplied by 1, makes but 1; so that which is less than 1, being multiplied by that which is less than 1, must needs make less than either of them. Or thus:

$$\begin{array}{r} \frac{2}{3} \\ \times \frac{1}{2} \\ \hline \frac{2}{6} \\ \frac{1}{3} \end{array}$$

To multiply Fractions of Fractions.

II. Reduce them into a single Fraction, then work as before.

Example. $\frac{3}{4}$ of $\frac{5}{8}$ by $\frac{1}{2}$ of $\frac{2}{3}$, being reduced they are $\frac{15}{32}$ and $\frac{1}{3}$: and being multiplied, facit $\frac{5}{64}$.

To multiply a whole Number and a Fraction together.

III. Multiply the Numerator By the whole

34. *Multipl. of Fractions.* Chap. 11.
whole Number, and divide the Product
by the Denominator.

Example
Multiply 4 by $\frac{3}{4}$ $\times 2$ (3 facit.

4

*To multiply a whole Number and a Fraction
by a whole Number.*

IV. Reduce the whole Number and
Fraction into an improper Fraction, then
work as before.

Exam. 2 and $\frac{2}{3}$ by 4. facit $3\frac{2}{3}$.

*To multiply a whole Number and a Fraction
by a whole Number and a Fraction.*

Reduce each of them into an improper
Fraction, and work as before in Sect. I.

Example.

Multiply 3 and $\frac{1}{2}$ by 2 and $\frac{1}{3}$.
 $1\frac{1}{2}$ by $\frac{7}{3}$ facit $2\frac{1}{2}$.

CHAP. XII.

Division of Fractions.

I. **A**S in Multiplication, so in this; all
Fractions that are to be divided,
must be reduced to single Fractions, both
for the Dividend and Divisor: Then set
that Fraction which is Dividend on the
left

Chap. 12. *Division of Fractions.* 85
 left hand, and that for Divisor on the right
 hand ; then multiply cross wise the Nu-
 merator of the Dividend by the Denomi-
 nator of the Divisor, and subscribe the
 Product for new Numerator : Likewise
 multiply the Denominator of the Divi-
 dend by the Divisors Numerator, and the
 Product shall be new Denominator.

Example.

What is the Quotient of $\frac{4}{5}$ divided by $\frac{1}{3}$?

*Place your Fractions thus,
 with this X Character
 between them, and work
 according to the dire-
 ctions before given.*

$$\begin{array}{r} \frac{4}{5} \times \frac{3}{1} \\ \hline \frac{12}{5} \\ \text{fa. } \frac{12}{5} \text{ or } 2 \text{ whole} \\ \text{ones, and } \frac{2}{5}. \end{array}$$

I demand the Quotient
 of $\frac{2}{3}$ divided by $\frac{1}{4}$?

$$\begin{array}{r} \frac{2}{3} \times \frac{4}{1} \\ \hline \frac{8}{3} \\ \text{facit } \frac{8}{3} \end{array}$$

In division of whole Numbers, the Di-
 vidend must be always greater then the Di-
 visor, otherwise you can make no Quo-
 tient. But in division of *Fractions* it is o-
 therwise ; as in the second question pro-
 pounded, $\frac{2}{3}$ to be divided by $\frac{1}{4}$; for $\frac{2}{3}$ is
 greater or more than $\frac{1}{4}$; yet it may be di-
 vided : for as the Multiplication of proper
Fractions (as was said before) doth dimi-
 nish the Product, so Division of proper
Fractions doth increase the Quotient.

II. To

II. To divide a whole Number by a Fraction.

I demand the Quotient of 20 divided by $\frac{1}{2}$?

20 being the whole Number, convert it into an improper Fraction, by placing an Unit for Denominator, and it standeth thus:

$$\begin{array}{r} \frac{1}{2} \times \frac{20}{1} \\ \hline \text{facit } \frac{40}{1} \end{array}$$

III. To divide a whole Number and a Fraction by a whole Number and a Fraction.

I demand the Quotient of 5 and $\frac{1}{2}$ divided by 3 and $\frac{1}{2}$?

$$\begin{array}{r} \frac{11}{2} \times \frac{2}{11} \\ \hline \text{facit } \frac{22}{22} \end{array}$$

IV. To divide Fractions of Fractions.

I demand the Quotient of $\frac{1}{2}$ of $\frac{2}{3}$ of $\frac{3}{4}$, divided by $\frac{2}{3}$ of $\frac{1}{4}$?

Reduce the Dividend into one single Fraction, and likewise the Divisor, then work as before.

$$\begin{array}{r} \frac{2}{12} \times \frac{6}{4} \\ \hline \text{facit } \frac{12}{48} \end{array}$$

CHAP.

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CHAP. XIII.

The Rule of Three.

I. **T**HE Rule of Three is commonly called, *The Golden Rule*; and indeed it might be so termed; for as Gold transcends all other Mettals, so doth this Rule all others in Arithmetick.

II. Now for your better information concerning it, you must observe that there are three Numbers known, by which a fourth that is unknown may be found out, which will bear like proportion to the third as the second doth to the first.

III. Here also is to be noted, that if your sums consist of sundry Denominations, then the first and third numbers must be of the same Denomination, as also the fourth and the second: As thus, if the first number be Yards, the third likewise must be Yards; if the second be Pence, then the fourth must be Pence.

IV. But the greatest difficulty lyeth in the stating of the Question.

There

Therefore observe first, That what you desire to know, or to be resolved in the Question, must be your third number; and you have commonly these words before it; as, *What cost? How long? How broad? How much? How deep, &c.*

2. Your Question being stated, bring first and third numbers into one Denomination.

3. Bring your second into the least name mentioned, or as low as you desire the Question to be answered in.

4. Observe whether your third number requires more or less; if more, then multiply the middle number by the greater of the two extremes, and divide by the lesser and the Quotient answereth the Question.

But if it require less, then multiply the middle number by the lesser of the two extremes, and divide by the greater.

These two words, *More* and *Less*, being well observed, the Scholar will understand what he doth, and need not to make two distinct *Rules of Three*, as most do.

The four first Questions are stated four several ways, by which the one is a proof of the other.

And

Chap. 13. *The Golden Rule.* 89

And thus you may easily work all the rest, which will be advantageous to the Scholar, and likewise an ease to the Master, I shall therefore onely give you the *facits* of the following Questions.

If 6 yards cost 10 s. what 12 yards?

10

—

120

xxs (20 shillings.

ss

If 12 yards — 20 s. — 6 yards?

20

—

120

xxs (10 s.

xxs

x

If 20 s. — 12 yards — 10 s.

12

—

120

xxs (6 yards.

xs

If 10 s. — 6 yards — 20 s.

6

—

120

xxs (12 yards.

xxs

If

If six men will be finishing a piece of Work ten days, how long time will 12 men be a doing the same?

<i>men.</i>	<i>days.</i>	<i>men.</i>
6	10	12
<hr/>		
10		
<hr/>		
60		

60 (5 days.

x2

If 12 men — 5 days — 6 men?

5
<hr/>
60

60 (10 days.

66

If 5 days — 12 men — 10 days?

12
<hr/>
60

60 (6 men

x2

If 10 days — 6 men — 5 days?

6
<hr/>
60

60 (12 men.

If 2 1

x
28920
2222

If 28

283
28920
2888

2
If 54

28988
448

If

Chap. 13. The Golden Rule. 91

If 2 lb cost 9 d. $\frac{1}{2}$, what cost 2 C. $\frac{1}{2}$?

4

4

39 qrs

10

28

80

20

280 lb.

39

2520

840

10920

If 280 lb. — 5460 qrs. — 2 lb.

2

10920

39 qrs. facit.

If 5460 qrs. — 280 lb. — 39 qrs.

280

3120

78

10902

92 The Golden Rule.

Chap. 13

Chap. 1

If 39 qrs. — 2 lb. — 5460 qrs.
2

If 1 d

xx

10920

xx (280 lb. facit.

xx

xx

If I spend 476 lb. 11 s. 10 d. a year, I demand how much that is one day with another?

If 31

da. l. s. d. da.
If 365 — 476. 11. 10 — 1

20

9531

xx

(1

19062

2(3

9532

xx(7

114382d.

xx4382(313

If 114

xx4382

xx4382

xx

If 114382

114382

Chap. 13. The Golden Rule. 93

If 1 da. ——— 313 d. ——— 365 da.
 313

1095
 3657
 10953
 1
 114382

If 313 d. ——— 1 da. ——— 114382 d.

(1
 x7 (3
 2040 (7
 xx4882 (365 da.
 xxxxx
 xxx
 x

If 114382 d. ——— 365 da. ——— 313 d.
 365

1565
 18787
 9393
 1

xx4882 (1
 xx4882

114382
 At

94 *The Golden Rule.* Chap. 1

At 15 d. $\frac{1}{2}$ per lb, how many C. weight for 11 l. 11 s. 11 d.

facit 1 C. $\frac{1}{2}$ 14 lb

If 9 ells $\frac{2}{3}$ cost 27 s. 5 d. what cost 8 pieces, each 25 yards, and $\frac{1}{4}$, and 12 pieces, each 19 ells $\frac{3}{4}$?

facit 275 l. 16 s. 8 d. $\frac{12}{25}$

If 100 lb. of Cloves cost 89 l. 11 s. 10 d. and 1 C. weight of Mace 96 l. 10 s. 02 d. what cost 3 $\frac{2}{3}$ one with another?

facit, 3 s. 3 d. $\frac{1704}{3392}$

If 1 pair of Stockens cost 10 groats, how many dozen pair shall I have for 100 marks?

facit 33 dozen pair

If 7 lb. $\frac{1}{2}$ of Currants cost 2 s. 7 d. what cost 3 Butts, each 15 C. $\frac{1}{2}$ 14 lb. gross tare 39 lb per Butt?

facit 88 l. 8 s. 0. $\frac{3}{4}$

If 5 ells $\frac{2}{3}$ of Cambrick cost 21 s. 8 d. what cost 120 pieces, viz. Els. qrs. na

A 30 qt. 272-2-1

Number. B 50 qt. 401-3-2

C 40 qt. 341-1-3

facit 203 l. 14 s. 6 d. $\frac{1}{2}$

1015-2-2

Sol

Chap. 13. *The Golden Rule.* 95

Sold 5 Bags of Pepper, each, viz. tare 43 lb. per Bag, and tret 4 lb. per 104 lb. at 15 d. $\frac{1}{4}$ per lb. neat, what comes it to neat?

Also I demand how many Dollars of 4 s. 8 d. a piece, will pay for the neat weight?

C. qrs.

Number $\left\{ \begin{array}{l} G \text{ qt. } 3-2 \\ H \text{ qt. } 4-1 \\ L \text{ qt. } 5-3 \\ M \text{ qt. } 2-1 \\ O \text{ qt. } 3-3 \end{array} \right.$

facit 508 Doll. $\frac{195}{224}$.

19—1

Sold 10 Packs of Cloth, each Pack 39 yards, at 11 s. 11 d. per yard: I demand how much it comes to in all?

facit 2323 l. 15 s. 0 d.

C. qrs. lb.

Bought of several persons 433—3—17 of Currants at 4 d. per lb. to whom I have sold 519 C. 3 qrs. 7 lb of Sugar, at 2d. $\frac{1}{2}$ per lb. Now I would know what remains for me to pay, they having taken the Sugar in part of payment.

809 l. 19 s. 00 Currants.

667 l. 01 s. 10 $\frac{1}{2}$ Sugar.

facit 142 l. 17 s. 01 $\frac{1}{2}$ rem. to pay.

A

A Merchant died, being indebted to several Creditors, (*viz.*) to A. 40 *l.* to B. 50 *l.* to C. 80 *l.* Now he being dead, his Estate was worth but 30 *l.* I demand what each man must have?

$$A \ 6 \frac{144}{178}$$

$$B \ 9 \frac{96}{178}$$

$$C \ 13 \frac{112}{178}$$

facit 30 *l.*

Bought 100 pieces of Cloth for 411 *l.* 11 *s.* 11 *d.* what containeth the Cloth, the yard being valued at 7 *s.* 8 *d.*

facit 1073 yards $\frac{67}{92}$.

If 1 pound of *Virginia* Tobacco cost 10 *d.* $\frac{1}{2}$, what cost 3 hogsheads, weight 17 C. $\frac{1}{2}$ 12 lb. gross, tare 39 lb. per hogshead, and 4 lb. per 104 lb. tret.

facit 78 *l.* 1 *s.* 0 *d.*

Also I demand how many Duckets of 3 *s.* 9 *d.* $\frac{1}{4}$ will pay for the neat weight?

facit 413 Duckets, $\frac{135}{100}$.

A

A Merchant hath owing 357 *l.* 9 *s.* and his Dr. doth agree with him to pay him for every pound 13 *s.* 5 *d.* I demand what must he pay?

facit 239 *l.* 15 *s.* 9 *d.*

A man died having three Sons and two Daughters, - he gave to the Eldest Son 1000 *l.* to the Second 1900. to the Third 1000 *l.* to the Eldest Daughter 700 *l.* to the Second 500 *l.* Now he being dead, his Estate was worth but 2020 *l.* I demand what each Child must have?

	<i>l.</i>
Eldest Son	662 $\frac{11}{8}$
Second Son	629 $\frac{11}{8}$
Third Son	331 $\frac{3}{8}$
Eldest Daughter	231 $\frac{49}{8}$
Second Daughter	165 $\frac{5}{8}$

facit 2020.

If I buy a piece of Cloth for 84 *l.* 11 *s.* and I sell the Ell *Eng.* for 7 *s.* 8 *d.* I demand how many yards were contained in the said piece?

facit 275 yards.

98 The Golden Rule. Chap. 13

Sold 4 parcels of Sugar containing
followeth:

C. qrs. lb.
The first containing 86--2--21 tare 8
The second containing 76--1--12 tare 5
The third containing 98--3--11 tare 9
The fourth containing 75--1--17 tare 8

At 35 s. per C. neat, facit 585 l. 6 s.

If 50 C. 3 qrs. 15 lb. of Sugar cost 21 l. 19 s. 11 d. how many Chests of 86 C. shall I have for 1000 Marks and 486 l.
facit 30 Chests and $\frac{8009}{288}$ of a Chest

If 5 penny weight of Silver cost 7 d. what cost 3 Ingots, each 11 lb. $\frac{1}{2}$?
facit 50 l. 0 s. 6 d.

If a Gent. hath 960 l. 12 s. per annum how much may he spend one day with another, to lay up 100 Marks at the years end to purchase withal?
facit 146 groats $\frac{346}{332}$ per diem

A Merchant bought 376 Cloaths at 11 l. 11 s. 1 d. per Cloth, which he shipped for Spain, to have Returns from thence the one half in Wine, at 28 l. per Tun and the other half in Sugar, at 27 l. per

Chap.

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Chap. 13. *The Golden Rule.* 99

of C. weight. I demand how much of each must be return'd for the said Cloaths?

77 Tuns $\frac{1912}{80}$ of Wine.
1609 C. 18. lb. $\frac{248}{14}$ of Sugar.

There are 101 Pipes of Oyl that contain 12307 gallons, I would know how much 59 Pipes and $\frac{1}{2}$ will contain, and what it will amount to at 36 l. per Tun, the Tun being 236 gallons:

facit 1105 l. 18 s. 7 d. $\frac{112}{200}$.

A Merchant bought 987 C. of Lead, which cost 7 l. 8 s. 5 d. per Forther, (of 19 C.) the charges upon the same amounts to 125 l. 12 s. which he ventures for France, to receive from thence French Wine at 13 d. 10 s. per Hogthead: I demand how many Hogtheads he must receive for content?

facit 287 Hogtheads $\frac{26087}{3200}$.

A Grocer delivered 7657 lb. of Tobacco in the Roll to be cut and dried, and when it came home it held out but 5839 lb. I demand what is lost in the pound, and also supposing it cost in the Roll 8 d. $\frac{1}{2}$ per lb. and the cutting

100 *The Rule of Three.* Chap. 14

1 d. $\frac{1}{2}$ per pound, I demand what it now stands him in ?

1 l. ----- 9 d. $\frac{1}{4}$ ----- 7657 l.
 It stands him in 311 l. 1 s. 3 d.
 7657 l. ----- 1818 l. ----- 1 l.
 facit $\frac{02}{3} \frac{6117}{7657}$ lost per Pound.

CHAP. XIV.

The Rule of Three in Fractions.

AS in the Rule of Three in whole Numbers, I laid down certain Principles both for the better discovering, and more easie working thereof ; so in this of Fractions, I shall endeavour to make all things as plain and familiar as may be.

And first because many Questions seem very ambiguous, whether they belong to the Rule of Three direct, or indirect.

That you may be rightly informed concerning them, cast your eye upon the third Number in the question, and see whether it be greater or less than the first Number.

But if you cannot easily apprehend which is the greater or lesser, then work according to the second section in pag. 80.

Chap. 15

What questions belong to the Rule of Three direct.

What questions belong to the Rule of Three indirect.

Having belongs, ther the of one reduced nations. 2. Th Fraction or least

What

*What
questions
belong to
the Rule
of Three
direct.*

If the Third Number be greater than the first, and the Answer required be greater than the second, it is upon the Rule of Three direct.

And likewise if the Third Number be less than the first, and the Answer required be less than the second, it belongs to the same Rule.

*What
questions
belong to
the Rule
of Three
indirect.*

But if the Third Number be less than the first, and the Answer required be greater than the second, it is pertaining to the indirect Rule.

And if the Third Number be greater than the first, and the answer required less than the second, it is according the same Rule.

Having thus found out to what Rule it belongs, first consider diligently, viz. whether the first and third Numbers be both of one Denomination, if not they must be reduced into the least of those Denominations.

2. That your second being a compound Fraction, must be reduced into the lowest, or least name mentioned.

F 3

Mul-

The operation of the Rule of Three direct. Multiply the Denominator of the first Fraction into the Numerator of the second & third, and the total thereof shall be Dividend.

Multiply also the Numerator of the first number by the Denominator of the second, and that Product by the Denominator of the third, and the Total shall be Divisor.

The operation of the Rule of Three indirect. But when the questions belong to the Indirect Rule, multiply the Numerator of the first and second together, and the whole thereof by the Denominator of the third, and the Product shall be Dividend.

Multiply also the Denominators of the first and second together, and the total thereof by the Numerator of the third, and the Product that ariseth therefrom shall be the Divisor.

If $\frac{2}{3}$ of 15 is 10
 $\frac{2}{3}$ of 15 is 10
 $\frac{2}{3}$ of 15 is 10

Ell

4
 10
 2
 40

40 | 2 4

2 1/2
 2
 2
 4
 24

24 | 1 1/2

1 1/2

4
 10
 2
 40

For Examples Questions

Examples.

If $\frac{2}{3}$ of an Ell cost $\frac{2}{3}$ of a l. what cost $\frac{4}{3}$?

$\frac{4}{3}$ Dividend. $\frac{2}{3}$ Divisor.

(1 l.
 $\frac{2}{3}$ 0 $\frac{1}{3}$ facit.
 20

Ell $\frac{2}{3}$ l. $\frac{2}{3}$ Ell

$\frac{4}{3}$ | $\frac{2}{3}$ l. facit.
 $\frac{4}{3}$ 0 $\frac{1}{3}$ facit.
 20

$\frac{2}{3}$ l. $\frac{2}{3}$ Ell. $\frac{2}{3}$ l. $\frac{2}{3}$

$\frac{24}{30}$ | $\frac{12}{30}$ | $\frac{4}{30}$ Ell facit.

1 l. $\frac{2}{3}$ Ell $\frac{2}{3}$ l.

$\frac{4}{3}$ | $\frac{2}{3}$ Ell facit.
 $\frac{4}{3}$ 0 $\frac{1}{3}$ facit.
 20

$\frac{24}{30}$ | $\frac{12}{30}$ | $\frac{4}{30}$ Ell facit.

For proof of these and the following Questions, the same method is to be observed,
 F 4 served,

104 *The Rule of Three.* Chap. 14

served, as in the Rule of Three in whole Numbers.

If $\frac{1}{2}$ lb. cost $\frac{3}{4}$ of a shil. what cost $\frac{1}{4}$ of lb.

$$\frac{1}{2}$$

$$\frac{3}{4}$$

$$(2) \text{ s.}$$

$$18 \text{ (1 } \frac{1}{8} \text{ facit.)}$$

$$18$$

If $\frac{1}{2}$ lb. cost 1 s. $\frac{1}{8}$. what cost $\frac{1}{4}$ lb?

$$\frac{1}{2}$$

$$\frac{1}{8}$$

$$\frac{1}{2}$$

$$\frac{2}{48} | \frac{36}{48} | \frac{18}{24} | \frac{9}{12} | \frac{3}{4} \text{ of a shil.}$$

If $\frac{3}{4}$ of a shil. buy $\frac{1}{2}$ lb. what will 1 s. $\frac{1}{8}$ buy?

$$\frac{3}{4}$$

$$\frac{1}{2}$$

$$\frac{1}{8}$$

$$\frac{1}{8}$$

$$\frac{36}{48} | \frac{18}{24} | \frac{9}{12} | \frac{3}{4} \text{ of lb.}$$

If 1 s. $\frac{1}{8}$ ——— $\frac{3}{4}$ lb. ——— $\frac{1}{4}$ s.

$$\frac{1}{8}$$

$$\frac{3}{4}$$

$$\frac{1}{4}$$

$$\frac{1}{4}$$

$$\frac{1}{4}$$

$$\frac{72}{144} | \frac{16}{72} | \frac{18}{36} | \frac{1}{2} \text{ of lb.}$$

To prevent discouragement to Young Scholars in the Questions of this Rule, which indeed are somewhat intricate, I advise them to turn to the Rule of Three

Three in whole Numbers, and exercise themselves well therein, and especially in such Questions as are most plain and easie, till they thoroughly understand the nature of the Rule ; by means whereof all other questions will be more easily wrought, be they never so difficult.

If 6 yards and $\frac{1}{2}$ cost 8 shillings, what cost 9 yards, and $\frac{1}{3}$?

facit 11 s. $\frac{2}{3}$

If 1 Dollar be 56 pence $\frac{2}{3}$, what 500 Dollars ?

1 — 56 d. $\frac{2}{3}$ — 500 *facit 117 l. 18 s. $\frac{2}{3}$*

If 2 ounces and $\frac{1}{2}$ cost 16 s. 5 d. what cost $\frac{1}{2}$ $\frac{3}{4}$?

facit 59 d. $\frac{1}{16}$

When the Bushel of Wheat is sold for 6 s. $\frac{2}{3}$ the half-penny white Loaf shall weigh 5 $\frac{3}{4}$ $\frac{11}{12}$. I demand how much it ought to weigh when the Bushel is sold for 7 s. $\frac{2}{3}$.

6 s. $\frac{2}{3}$ ----- 5 $\frac{3}{4}$ $\frac{11}{12}$ ----- 7 s. $\frac{2}{3}$
facit 5 $\frac{3}{4}$ $\frac{7}{12}$

E s

Et

If 1 yard cost 9 s. what cost 4 yards?

facit 43 s.

If 3 Ells $\frac{1}{2}$ cost 15 d. what cost 6 Ells?

facit 2 s. 7 d.

If $\frac{1}{2}$ of a yard cost $\frac{1}{2}$ of a l. what cost 1 yard?

facit 10 s.

If 3 yards and $\frac{1}{2}$ cost 4 l. 14 s. $\frac{24}{5}$. What cost $\frac{1}{2}$ of an Ell Flemish?

603	4254	72	<i>facit.</i> 17 s. $\frac{1133}{19152}$
11	45	7	

If 1 lb. cost 6 d. $\frac{1}{2}$. what cost 4 l. $\frac{1}{2}$?

facit 30 d.

If 1 Ell $\frac{1}{3}$ cost 9 s. $\frac{7}{8}$. what cost 1 yard?

facit 4 s.

I lent my friend $\frac{1}{2}$ of a French Crown for three weeks, that he should do as much for me another time: but when I came to borrow of him he could lend me but $\frac{1}{2}$ of a Crown: I demand how long time I must keep his money to requite my former kindness.

facit 4 weeks $\frac{1}{2}$

If 1 pistolet be 5 s. $\frac{1}{10}$, what shall 430 be? thus.

$$1 - 5s. \frac{1}{10} - 430 \quad \text{facit } 126 \text{ l. } 17 \text{ s.}$$

If 13 lb. cost me 3 l. how many lb. shall I have for 97 d?

$$\text{facit } 1 \text{ lb } \frac{4}{13}$$

If 1 lb. cost 9 d. $\frac{1}{2}$, what cost 6 lb. 9 $\frac{3}{4}$?

$$\text{facit } 342 \frac{1}{10}$$

If 5 yards of Velvet cost 4 l. 3 d. $\frac{1}{2}$, what cost 4 yards $\frac{2}{3}$?

$$\text{facit } 3742 \text{ qrs. } \frac{3}{11}$$

If 1 C. $\frac{1}{2}$ cost 4 l. 12 s. what cost 1 C?

$$\frac{11}{7} - 92 \text{ s.} - \frac{3}{8} \quad \text{facit } 33 \text{ s. } \frac{13}{14}$$

If 1 C. cost 11 l. $\frac{8}{10}$, what cost 4 $\frac{3}{5}$?

$$\begin{array}{r} 3584 \\ 1218 \\ \hline 2.1117 \end{array} \quad \begin{array}{r} 9 \\ 2 \\ \hline \end{array} \quad \text{facit.}$$

If $\frac{3}{4}$ of an Ell cost 1 l. 2 s. what cost 1?

$$\text{facit } 32 \text{ s. } 1 \text{ d.}$$

If 10 Ells cost 3 l. $\frac{2}{3}$, what cost 1 yard?

$$\frac{20}{5} - \frac{18}{5} - \frac{4}{5} \text{ facit.}$$

If 1 C. cost 1 of 10 lb. what cost 1 C.?

$$\frac{11}{21} - \frac{6}{21} - \frac{5}{21} \text{ facit.}$$

108 *The Rule of Three. Chap. 14*

If $\frac{1}{2}$ of C. cost $\frac{6}{11}$ lb. what will 3 s. 7 buy?
 $\frac{10}{11}$ s. — C. $\frac{3}{11}$ — $\frac{3}{11}$ s. facit.

If $\frac{1}{2}$ of a yard of Cloth in length, and 1 yard $\frac{1}{4}$ broad make a Childs Coat, I demand how much stuff will make the same Child a Coat when the stuff is but $\frac{1}{4}$ of a yard broad?

7 — $\frac{1}{4}$ — 3 facit 1 yard

If 8 lb. $\frac{1}{4}$ cost 2 l. 11 s. $\frac{1}{4}$, how many lb. shall I buy for 4 l. $\frac{1}{8}$?

facit.

If $\frac{1}{2}$ of 1 C. cost $\frac{1}{12}$ of l. what cost $\frac{1}{2}$ of a pound?

facit.

If $\frac{1}{2}$ of $\frac{1}{2}$ cost $\frac{1}{12}$ of a penny, how much shall I buy for $\frac{1}{12}$ of 20 s?

facit.

If $\frac{1}{12}$ of a pound cost $\frac{1}{12}$ of l. how many pounds shall I have for 2 l. 7 s. 3 d. $\frac{1}{2}$?

facit.

How many yards was bought for 142 l. 11 s. 2 d. when the $\frac{1}{2}$ of 1 yd cost 6 s. $\frac{1}{2}$?

facit.

Chap. 14. in Fractions. 109

If 1 C. $\frac{1}{2}$ 12 lb $\frac{1}{2}$ cost 2 l. $\frac{1}{2}$, what cost $\frac{7}{8}$ of an $\frac{1}{2}$?

facit 540000

If 26 lb at Antwerp be 27 lb. $\frac{7}{8}$ at London, how many pounds at Antwerp are 56 lb. at London?

facit $52\frac{12}{17}$

If 8 Els at Antwerp be 5 Els $\frac{1}{2}$ at London, how many Els at Antwerp are 150 Els $\frac{7}{8}$?

facit 231 Els $\frac{109}{143}$

If 3 $\frac{1}{2}$ times 3 $\frac{1}{2}$ lb. cost 1 $\frac{1}{2}$ times 1 $\frac{1}{2}$ l. what shall amount unto $\frac{1}{2}$ times $\frac{1}{2}$ of the $\frac{7}{8}$ of 12 l. $\frac{1}{4}$?

facit $9\frac{147}{143}$ of a l.

If $\frac{1}{2}$ less $\frac{1}{2}$ lb. cost 2 $\frac{1}{2}$ l. and the $\frac{1}{2}$ of $\frac{7}{8}$ lb. what shall 10 lb. less $\frac{1}{2}$ and $\frac{1}{4}$ of 3 $\frac{1}{2}$ lb. amount unto?

facit 135-17-0-3

When $\frac{1}{2}$ and $\frac{1}{4}$ of a lb. cost $\frac{1}{2}$ l. each pound to contain 24 s. $\frac{1}{2}$, what shall then less $\frac{1}{8}$ Ell amount unto?

facit 1 $\frac{22}{336}$ d.

When

110 *The Rule of Three, &c. Chap. 14.*

When $\frac{1}{3}$ of 5 Ells less $\frac{1}{3}$ of an Ell cost $\frac{1}{3}$ of 9 $\frac{1}{2}$ l. less $\frac{1}{3}$ of a l. what then shall $\frac{1}{2}$ of 6 Ells less $\frac{1}{3}$ of an Ell?

$$\frac{4}{3} \text{ --- } \frac{27}{18} \text{ --- } \frac{5}{2} \text{ facit } 1 \frac{41}{82} \text{ l.}$$

If $\frac{2}{3}$ of 20 lb. cost 36 l. less $\frac{1}{3}$ of 30 l. I demand to how much $\frac{5}{6}$ of 40 lb. and $\frac{5}{12}$ of 30 lb. will amount unto?

$$\frac{40}{1} \text{ --- } \frac{27}{2} \text{ --- } \frac{15}{72} \text{ facit } 35 \frac{221}{320} \text{ l.}$$

If 10 Ells and $\frac{1}{4}$ of $\frac{1}{2}$ quarter, and yet more $\frac{1}{4}$ and $\frac{1}{4}$ of $\frac{1}{4}$ of an Ell cost 12 l. and $\frac{2}{3}$ of $\frac{1}{3}$ of l. what then shall two Ells and $\frac{1}{2}$ and $\frac{1}{5}$ of $\frac{1}{4}$, and yet more $\frac{1}{3}$ of 1 and $\frac{1}{12}$ part of an Ell amount unto?

$$\frac{763}{72} \text{ --- } \frac{149}{12} \text{ --- } \frac{1399}{480} \text{ facit } 3 \frac{2031}{480} \text{ l.}$$

If $\frac{1}{16}$ of 50 lb. less $\frac{1}{3}$ of $\frac{2}{3}$ of $\frac{2}{3}$ of 35 lb. cost $\frac{3}{10}$ of 60 l. and yet more $\frac{3}{5}$ of the $\frac{1}{2}$ of $\frac{3}{10}$ of 60 l. what shall then amount unto $\frac{1}{3}$ of $\frac{1}{4}$ l. less $\frac{1}{3}$ of the said $\frac{1}{3}$ of $\frac{1}{4}$ l.

$$\frac{655}{42} \text{ --- } \frac{117}{2} \text{ --- } \frac{1}{2} \text{ facit } \frac{1071}{32750} \text{ l.}$$

If 18 lb. less $\frac{5}{8}$ of $\frac{1}{8}$ of an $\frac{1}{3}$ of Saffron cost 31 l. and $\frac{1}{4}$ of 5 s. less $\frac{3}{4}$ of $\frac{1}{4}$ of what shall then amount unto 1 $\frac{3}{4}$ l. and $\frac{1}{4}$ of $\frac{3}{4}$ of 5 s. accounting for these last pounds 32 ounces to the pound?

$$\frac{2779}{42} \text{ --- } \frac{4007}{72} \text{ --- } \frac{149}{72} \text{ facit } 6 \text{ l. } 1 \text{ s. } \frac{42421}{1075}.$$

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CHAP. XV.

Rules of Practice.

Tables of Practices.

s. d.

The even parts of a pound.

10-0	is	$\frac{1}{2}$
6-8	is	$\frac{1}{3}$
5-0	is	$\frac{1}{4}$
4-0	is	$\frac{1}{5}$
3-4	is	$\frac{1}{6}$
2-6	is	$\frac{1}{8}$
1-6	is	$\frac{1}{12}$

d.

The even parts of a shilling.

6	is	$\frac{1}{2}$
4	is	$\frac{1}{3}$
3	is	$\frac{1}{4}$
2	is	$\frac{1}{6}$
1-6	is	$\frac{1}{12}$
1-8	is	$\frac{1}{16}$

Before the Learner can well proceed farther, he must get these Tables very perfectly by heart. I might puzzle his head with some others, which because I conceive would be troublesome & burthen some to his memory, therefore I shall omit

2-12	--	24
3-12	--	36
4-12	--	48
5-12	--	60
6-12	--	72
7-12	--	84
8-12	--	96
9-12	--	108
10-12	--	120
11-12	--	132
12-12	--	144
them,		

112 *Rules of Practice.* Chap. 13.
 them and observe this plain and easie method following.

And first I shall begin with the even parts of a shilling..

I. When the price is an even part of a shilling, consider what part of a shilling it is, which being found, divide the sum proportioned by it, and the quotient will be shillings. As in these six examples following will appear.

<i>Ells.</i>	<i>d.</i>	<i>lb.</i>	<i>d.</i>
$\frac{1}{2}$ 8468 at 6 Ell.		$\frac{1}{2}$ 3618 at 2 per lb.	
423 4		60 3	
211 - 14 - 0 facit.		30 - 3 facit.	
$\frac{1}{4}$ 867 at 4 per Ell.		yards. <i>d.</i>	
28 9		$\frac{1}{8}$ 2760 at $1\frac{1}{2}$ per y.	
14 - 9 - 0 facit.		34 5	
<i>lb.</i>		17 - 5 facit.	
278 at 3 d. per lb.		<i>lb.</i> <i>d.</i>	
6 9		$\frac{1}{12}$ 4896 at 1 per lb.	
3 - 9 - 0 facit.		40 8	
		20 - 8 fa.	

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II.

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Ells.

$\frac{1}{4}$ 420

$\frac{1}{12}$ 105

Having gone thus far upon those even parts of a shilling that are most easie, I must entreat the Learner to return back to a farthing, an half-penny, three farthings, &c. to the other parts of a shilling.

II. When the price is Farthings or Half-pence, bring the given summe into Pence, and work as before in the last question; but when they are uneven parts, as penny-farthing, penny-three-farthings, two-pence-farthing, or the like; Begin first with the even parts of a shilling: As for instance, 6396 Ells at 5 farthings per Ell, work first for the penny, as before; then consider, if at the price of a penny they come to so many shillings, then the farthing must be the fourth part of them, which being taken and added together, your work is done.

<i>Ells.</i>		<i>Ells.</i>
420 at 4 d. per El.		716 at 4 d. per El.
<u>105</u>		<u>358</u>
8 9 d. facit.		2 1 9 10 d. facit.
		1 9 10 facit.

Ells.

Ells.	d.	Ells.	d.
6396 at $\frac{1}{2}$ per El.		7225 at $1\frac{1}{2}$ per. El	
3198		903-1 $\frac{1}{2}$	
266--6 d.		150-6 $\frac{1}{4}$	
33--3		105 3	
39 9		52-13-7 $\frac{1}{2}$ fa.	
5712 at $\frac{1}{2}$ d.			
476			
59 5			
29-15 facit.			

III. When any thing doth remain of any Division, it is of the same Denomination as the Dividend was, as here in the last Example 7225 three half pence being divided by 8, there remains one three half pence.

$\frac{1}{2}$	864
$\frac{1}{8}$	144
	18
	16
	8-
$\frac{1}{2}$	371
$\frac{1}{4}$	61
	15
	77
	38
$\frac{1}{2}$	47
$\frac{1}{4}$	6
$\frac{1}{2}$	1
	4

Chap. 15. Rules of Practice. 119

$\frac{1}{2}$ 864 at 2 d. $\frac{1}{4}$

$\frac{1}{8}$ 144
18

16 | 2

8-2-0 fa.

$\frac{1}{8}$ 3714 at 2 d. $\frac{1}{2}$

$\frac{1}{4}$ 619

154-9

77 | 3

38-13-9 fa.

$\frac{1}{8}$ 417 at 2 d. $\frac{3}{4}$

$\frac{1}{4}$ 69-6

$\frac{1}{2}$ 17-4

$\frac{1}{4}$ 8-8

9 | 5-6 $\frac{1}{2}$

4-15-6 $\frac{1}{2}$ fa.

$\frac{1}{2}$ 3716 at 3 d. $\frac{1}{4}$

$\frac{1}{12}$ 929
77 $\frac{1}{5}$

100 | 6

50-6-5 facit.

$\frac{1}{4}$ 41712 at 3 d. $\frac{1}{2}$

$\frac{1}{8}$ 10428

1738

1216 | 6

608-620 facit.

$\frac{1}{4}$ 817 at 3 d. $\frac{1}{2}$

$\frac{1}{4}$ 204-3 d.

51-6 $\frac{1}{4}$

25 | 5

12-15-3 $\frac{1}{4}$ facit.

7138

$\frac{1}{2}$	7138 at 4 d. $\frac{1}{2}$
$\frac{1}{2}$	1189 - 8
	1189 - 8
	148 - 8 $\frac{1}{2}$
	252 8 - 0
	126 - 8 - 0 $\frac{1}{2}$ fa.
$\frac{1}{2}$	5171 at 4 d. $\frac{1}{2}$
	1723 - 8
$\frac{1}{8}$	215 - 5 $\frac{1}{2}$
	139 9 - 1
	96 - 19 - 1 $\frac{1}{2}$ fa.
$\frac{1}{4}$	17 at 4 d. $\frac{1}{4}$
$\frac{1}{2}$	323 - 8
	40 - 5 $\frac{1}{2}$
$\frac{1}{2}$	20 - 2 $\frac{1}{2}$
	38 4 - 4 $\frac{1}{2}$
	19 - 4 - 4 $\frac{1}{2}$ fa.

$\frac{2}{3}$	712 at 5 d.
$\frac{1}{2}$	237 - 4
	59 - 4
	29 6
	14 - 16 - 8
$\frac{1}{2}$	3716 at 7 d.
$\frac{1}{2}$	1858
	309 - 8
	216 7
	108 - 7 - 8. facit.
	8716 at 8 d.
$\frac{2}{3}$	2905 - 4
	2905 - 4
	581 0 - 8
	290 - 10 - 8 facit.

Chap.	$\frac{1}{2}$	637
	$\frac{1}{2}$	318
	$\frac{1}{2}$	159
		477
		238
	$\frac{1}{2}$	846
	$\frac{1}{2}$	423
	$\frac{1}{2}$	211
	$\frac{1}{2}$	70
	$\frac{1}{2}$	70
	$\frac{1}{2}$	35
	$\frac{1}{2}$	468
	$\frac{1}{2}$	234
	$\frac{1}{2}$	156
	$\frac{1}{2}$	39
	$\frac{1}{2}$	429
	$\frac{1}{2}$	214

Chap. 15. Rules of Practice. 117

$6371 \text{ at } 9 \text{ d.}$

$3185 - 6$

$1592 - 9.$

$477 | 8 - 3$

$238 - 18 - 3 \text{ facit.}$

$846 \text{ at } 10 \text{ d.}$

423

$211 - 6$

$70 - 6$

$70 | 5 - 0$

$35 - 5 - 0 \text{ facit.}$

$4687 \text{ at } 11 \text{ d.}$

$2343 - 6 \text{ d.}$

$1562 - 4$

$390 - 7$

$429 | 6 - 5$

$214 - 16 - 5 \text{ fac.}$

$2716 \text{ at } 12 \text{ d.}$

$271 | 6$

$135 - 16 - 0 \text{ facit.}$

$3762 \text{ at } 12 \text{ d.}$

1881 d.

$940 - 6$

$940 - 6$

$78 - 4$

$384 | 0 - 4$

$192 - 0 - 4 \frac{1}{2} \text{ fac.}$

5627 Ells at 13 d. per Ell.

IV. As for the 12 d. that is done to your hand, there being so many shillings as there are Ells: then for the penny, consider that 12 pence per Ell it comes to so much, & the odd penny take $\frac{1}{12}$ of the giving sum, which will make likewise shillings. And thus you may do touching any of the following questions, by taking the even or uneven parts, as you have learned before.

2684 at 13 d.	
$\frac{1}{12}$	2684
	223-8 d.
290 7	
145-7-8 facit.	
8642 at 14 d.	
$\frac{1}{8}$	8642
	1460-4 d.
1010 2	
505-2-4 facit.	

7684 at 15 d.	
$\frac{1}{4}$	7684
	1921
960 5	
480-5 facit.	
3716 at 16 d.	
$\frac{1}{2}$	3716
	1238-8 d.
495 4	
257-14-8 fa.	

314

1230

268

121

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he $\frac{1}{8}$, for
he $\frac{1}{4}$, for
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3141 at 17 d.

417 at 21 d.

1236 at 18 d.

1021 at 22 d.

26812 at 19 d.

317 at 23 d.

1213 at 20 d.

1712 at 25.

V. Observe that as many yards as there are, so many two shillings, therefore multiply by 2, and the Product are shillings: and this method you may observe in all others.

Or this, if you will:

For those even parts of a pound that are most familiarly known, as two shillings you may take the $\frac{1}{10}$, for two shillings and 6 pence the $\frac{1}{8}$, for 3 shillings and 4 pence the $\frac{1}{6}$, for 4 shillings the $\frac{1}{5}$ for 5 shillings the $\frac{1}{4}$, for 6 shillings and 8 pence the $\frac{1}{3}$, for 10 shillings the $\frac{1}{2}$.

lb.	1712 at 2s. per lb.
	2
	<hr/>
	34214
	<hr/>
	171 - 4 - 0 facit.
	Ells.
	17260 at 2 s. 1. d.
	2
	<hr/>
	14520
	605
	<hr/>
	1512 5
	<hr/>
	756 - 5 - 0 fa.

	412 at 2 s. 3 d.
	<hr/>
	106 at 2 s. 4 d.
	<hr/>
	171 at 2 s. 5 d.
	<hr/>

$\frac{1}{8}$	3672 at 2 s. 2 d.
	2
	<hr/>
	7344
	612
	<hr/>
	79516
	<hr/>
	397 - 16 - 0 fa.
	If pence be re-
	quired in the que-
	stion, the parts for
	pence take out of
	the given sum, as
	in these three last
	Examples do ap-
	pear.

	1410 at 2 s. 6 d.
	<hr/>
	712 at 2 s. 7 d.
	<hr/>
	100 at 2 s. 8 d.
	<hr/>

6101 at 2 s. 9 d.

6109 at 2 s. 11d.

1006 at 2s. 10d.

4672 Ells, and $\frac{1}{2}$ at 4 s. and 4 d. per Ell.

Questions of this nature that do consist of several denominations, as $\frac{1}{2}, \frac{1}{3}, \frac{1}{4}, \frac{1}{5}, \&c.$ are wrought as before, onely for the half Ell, take half of the given price of an Ell, $\&c.$ For a quarter, take a quarter of the price, $\&c.$ and add it to the former sum.

Example.

Eds.

C. S. D.

4672 $\frac{1}{2}$ at 4 s, 4 d. $\frac{1}{2}$

17 $\frac{1}{4}$ at 17 7 per C

4 2 2

17 4 $4\frac{3}{4}$

18688

1

110

1557-4d.

170 d.

2-2

8-6

2024/7:6

I-5

4-43

IOI2-7-6 fa.

30/3:3

15-3-3 1/2

G

VII. IF

If the price required be concerning pounds neat, you must reduce the hundreds grosse into pounds grosse, and subtract the pounds tare from them, and the remains will be pounds neat.

32 C gross, tare 172 lb. at 7 d. per. lb. neat.	
<u>32</u> 112	
<u>64</u> 32 32	
3584 lb. gross. 172 lb. tare.	
<u>3412 lb. neat.</u> l. d.	
$\frac{1}{3}$ 3412 at 7 per lb.	
$\frac{1}{6}$ 1706 284 - 4 d.	
<u>199 0</u>	
99 - 10 - 4 fac.	

36 C gross, tare 94 lb. at 14 d. per. lb. neat.	
<u>36</u> 112.	
<u>72</u> 36 36	
4032 lb. gross. 94 lb. tare.	
<u>3938 lb. neat.</u> l. d.	
3938 at 14 per lb.	
$\frac{1}{6}$ 3938 656 - 4 d.	
<u>459 4 - 4</u>	
229 - 14 - 4 facit.	

VIII. Again

Chap. 15
VIII. Ag
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56 C. 17 l. pe per l. n	
<u>56</u> 112	
112 56	
<u>56</u> 6272 l 952 l	
5320 l	
5320 l	
2650	
1330	
399 0	
199 - 1	

VIII. Again observe whether the pounds
 be absolutely so much as in the last
 example, or whether it be so much *per Bag*
 or *C. or Barrell, &c.* if it be any of these,
 multiply the tare given by the C. Bag, or
 Barrell, and the Product will be pounds
 tare, which subtract from the pounds gross
 and the remains are pounds neat.

Example.

56 C. gross, tare
 17 l. per C. at 9 d.
 per l. neat.

56	56
112	17
112	392
56	56
56	952

6272 lb. gross.
 952 lb. tare.

5320 lb. neat.
 d.

5320 l. at 9 per l.

2650
1330
399 0

199 - 10 - facit.

12 C. gross, tare
 13 lb. per C. at
 18 d. per lb.

12	12
112	13
24	36
12	12
12	156 lb. ta.

1344 lb. gross.
 156 lb. tare.

1188 lb. neat.
 lb. d.

1188 at 18 per l.

1188
594
188 2

89 - 2 - 0 facit.

IX. Observe whether the given price required be at so much *per C.* if so, then bring your pounds tare into *C.* and subtract them from the *C.* gross.

Example.

17 C Gross, tare 11 lb. per C at 15 s. per C neat.	20 C gross, tare 13 l. per C at 12 s. per C neat.
17	13
11	20
17	206 lb. ta.
17	36 C qrs. lb.
187 lb. tare	268 (2-1-8 ta)
75 C. qrs. lb.	xxx
xx7 (1-2-19 ta.	C qrs. lb.
xxx	20-0-0 gross.
C. qrs lb.	2-1-8 tare.
17-0-0 gross.	17-2-20 neat
1-2-19 tare.	C. qrs. lb.
15-1-9 neat.	17-2-20 ne. at 12 s.
C. qrs. lb. s.	12 per C
15-1-9-at 15. per C	34
15	17
75	204
15	6
225 d.	21 d.
3-9	2 1 2
1-0 $\frac{3}{4}$	10-12-1 d. fa
2-9-9 $\frac{3}{4}$	X.
11-9-9 $\frac{3}{4}$ facit.	

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X. I think those former Rules well observed, to be sufficient for your instruction touching Tare, only if the gross hundreds have several species, as $\frac{1}{2}, \frac{1}{4}, \frac{3}{4}$ odd pounds, or the like, then consider, if one hundred give so much tare, then a quarter of a C. will give a quarter so much; and if one quarter give so much, 14 pound will give half so much; and if 14 pound give so much, then 7 pound will give half as much &c. Example:

13 C. $\frac{1}{2}$ gross, tare 12 pound per C at 2 s. 3 d. per pound neat.	96 C $\frac{1}{4}$ 14 pound gross, tare 13 lb. per C at 3 s. 6 d. per pound neat.
--	--

What Treat is.

XI. Having thus shewed you the way finding out the Tare, I come in the next place to shew you how to find out the treat, which is a certain allowance of 4 lb. per 104 lb. upon many sorts of Commodities.

Example.

39 C. Gross, Tare 15 lb. per cent, and 4 lb. per 104 lb. Treat, at 4 s. 6 d. per lb. neat.

G 3

1. Bring

1. Bring the C gross into pounds gross.
2. Multiply the lb. tare by the C gross and the Product is the pound tare.
3. Subtract the lb. tare from the lb. gross, and the remain is subtil pounds which pounds divide by 26, because 26 contained 4 times in 104, and as often it is contained, so many pounds Treat there are, which subtract from the subtil pounds, and the remain will be neat pounds.

C.	
39	39
112	15
<hr/>	<hr/>
78	195
39	39
39	<hr/>
<hr/>	585 lb. tare.
4368 lb. gross	(1
585 lb. tare	xx4 lb.
3783 lb. subtil.	378 (3 (145 treat
145 lb. treat.	2666
<hr/>	22
3638 lb. neat.	

at 4 s. 6 d. per lb. fa. 821 l. 1 s.

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Other wayes there are to find out the tare, but I conceive these are the most plain for young Learners: However, I shall give them one or two Examples of another manner of working, which is both very commendable and speedy.

1. When the Tare is 14 pound *per cent.* take the $\frac{3}{4}$ part of the pounds gross, and the quotient will be pounds tare.

2. When the allowance is Tare 16 pound *per cent.* take the $\frac{3}{4}$ part, or divide it by 7, and the quotient will be pounds tare.

3. Suppose it were tare 24 pound *per cent.* work first for 16 as before, then take the $\frac{1}{2}$ of that which 16 cometh to, for if 16 produce so much, 8 must produce the $\frac{1}{2}$ of that which being added will make the pounds tare for 24 pounds *per cent.*

Again, suppose it were at 20 pound *per cent.* you may work first for 16, and then 4 will be the $\frac{1}{4}$ of that quotient, which being added maketh the total of your pounds tare for 20 pound *per cent.*

Again, suppose it were for 12 pound *per cent.* tare, work as before for 16, which quotient is for 4 too much, therefore take the $\frac{1}{4}$ of that and subtract

G 4 from

from that of 16, and the remains will be pounds Tare, or 12 pound *per cent*.

Again, suppose it were 7 pounds *per cent*. tare, work for 14, and if 14 comes to so much, then 7 will be $\frac{1}{2}$ of that : and you may with ease work all questions of this kind, by making 14 or 16 your standing Rule, adding and subtracting the part or parts of it more or lesse, as occasion requires. I might say more as to this, but shall forbear, only I will give you two or three Examples ready cast up, and state a few others to exercise your Ingenuity therewith.

48 C. Gross, Tare 14 lb. *per cent* :
at 10 d. $\frac{1}{2}$ *per lb.* neat.

C

48 4704 lb. at 10 d. $\frac{1}{2}$ *per lb.*

112

96

48

48

$\frac{1}{2}$ 5376 lb. gross.
672 lb. tare.

4704 lb. neat.

56 C.

56 C.
16 p
at 9
neat.

22
25

18
45

$\frac{1}{7}$ 630
90

$\frac{1}{2}$ 540

$\frac{1}{2}$ 270
135

405

202

56 C $\frac{1}{2}$ gross, tare
16 pound per cent
at 9 d. per pound
neat.

C.
56 $\frac{1}{2}$
4

225
28

1800
450

6300 lb. gross.
900 lb. tare:

5400 lb. neat at 9

2700
1350

405 | 0

202-10-0 fa.

97 C $\frac{1}{2}$ 11 pound
gross, tare 24 lb.
per cent. at 5 d.
per pound neat.

97 $\frac{1}{2}$ 11
4

391
28

3129
783

10959 lb. gross.

1565
0782

2347 lb. tare.

8612 lb. ne. at 5

2870 - 8 d.
717 - 8

358 | 8 - 4

179 - 8 - 4 facit.

19 C.

19 C $\frac{1}{2}$ 11 pound
grosse, Tare 18
pound per cent.
at 7 d. $\frac{1}{2}$ per lb.
neat.

20 C $\frac{1}{2}$ 13 pound
grosse, Tare 12
pound per cent.
at 10 d. per lb.
neat.

34 C $\frac{1}{2}$ 19 pound
grosse, Tare 7
pound per cent. at
11 d. per lb. neat.

86 C $\frac{1}{2}$ 13 pound
grosse, Tare 12
pound per cent. at
8 d. per lb. neat.

13 C $\frac{1}{2}$ grosse,
Tare 22 pound
per cent, at 16 d.
per pound neat.

19 C $\frac{1}{2}$ 19 pound
gross, Tare 19
lb. per cent, at 16
d. per lb. neat.

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C H A P. XVI.

The Double Rule of Three.

HAVING somewhat at large insisted upon the two last Rules, viz. the Rule of Three and Practice, I come to the second Rule of Proportion, commonly called *The Double Rule of Three*, which hath its denomination from its double working: And as I did in the former Rule of Three proceed with one plain and easie working of the same, either Direct or Indirect, So I shall here also observe the same Order; But here first a diligent heed must be had unto the stating of the question, because under this Rule is comprehended divers Rules of *Plural Proportion*. Therefore observe as in the former Rule of Three, so in this.

1. That first and third numbers be both of one species, viz. if the first number be principal, the third must be principal, if the first be Interest, the third must be Interest.

If the first be time, the third must be time. If the first be men, the third must be men.

2. Ob-

2. Observe that the two first terms in the question do consist of a Supposition, and the third term of Demand.

Example.

If 100 l. in 12 months gain 6 l. what shall 276 s. gain in 18 months?

1. Here you see the Supposition is,

If 100 l. gain 6 l.

2. The demand is, What will 276 l. gain?

100 l.	6 l.	276 l.
	20	1440
	<hr/>	<hr/>
	120	11040
	12	1103
	<hr/>	<hr/>
		276
	1440	

* Cut off the two first figures and the rest are pence, viz. 3974 d.

3974/40*

Then say;

If 12 mon. — 1974 d. — what 18 mon. facit 5961 d.

If 6 Clerks can write 45 sheets of paper in 5 days, how many Clerks can write 300 sheets in 13 days after that proportion?

Sheets.

* Observe
so in other
the dem
or less,
hath bee

If t
miles c
carried
C
56

Chap. 16. The Rule of Three.

133

Sheets.

Clerks.

Sheets.

45

6

300

6

1800

x

1800 (40 Clerks.

xxx

x

Days.

Clerks.

Days.

5

40

13

5

200

* Observe here, and so in others, whether the demand be more or less, and work as hath been taught.

7 (5 Clerks.

200 (15 1/3 facit.

xxx

x

If the carriage of 56 C. weight 100 miles cost 14 l. what will 13 C. cost, being carried 29 miles, after that rate?

C.

lb.

C.

56

14

13

14

52

13

182

(14

182 (3 l. 5 s.

86

II

If 100 miles — 3 l. 5 s. — 29 miles.

20

65

65

145

174

facit 18 s. $\frac{17}{20}$

18 | 85

If 8 Taylors make 4 suits of Cloaths in 10 dayes, how many will make 15 suits in 14 dayes?

If 4 suits require 8 Taylors, what will 15 suits require?

8

xxx (30 facit.

120

##

If 10 da. ——— 30 Ta. ——— 14 da.

30

300

26

xxx (21

xxx

x

Of what principal was 150 l. gained in 19 months, when 100 l. in 12 months gain 6 pound?

facit 1578 $\frac{1}{2}$ principal

How

Chap. 16. *The Golden Rule.* 135

How long time was 900 *l.* gaining 420 *l.* when 6 *l.* was gained of 100 *l.* in 12 moneths?

facit 93 months $\frac{1}{2}$

A Scrivener lent 700 *l.* at interest the 22d of October 1639, and upon the 9th of Decem. 1645 received for interest thereof 330 *l.* I demand at what price *per cent.* *per ann.* it was lent?

The time is 6 years

I mon. 17 dayes.

facit 7 *l.* $\frac{837}{1000}$

If I sow 20 Bushels of Pease, and they produce in one year 276 Bushels; I demand how many bushels in 6 years will 90 bushels produce after that proportion?

facit 7452 Bushels.

What is the principal that gained 476 *l.* in 16 months, when 100 *l.* in 12 months gained 6 *l.*

5950 *l.* principal,

In what time was 850 *l.* gained of 940 pounds, when 100 *l.* in 12 months gain 6 pounds?

facit 15 years, 25 da. $\frac{25}{12}$

If 100 *l.* in 12 gained 6 *l.* what monies was that which gave me in 8 months 10 pound.

facit 250 *l.* principal.

If 4 s. 8 d. pay 1 Souldier for 1 week,
how many Dollars at 4 s. 2 d. will pay 80
men for one moneth?

facit 358 Dollars $\frac{2}{3}$

An Usurer lent the 11 July 1647, a sum
of money at Interest for 6 l. per cent. and
on the 27 of Feb. 1651 received for
Interest thereof 318 l. 12 s. I demand
what was the sum lent?

The time between
the 11 of July 47
to the 27 of Feb.
51, is 4 yea. 7 mo.
16 dayes.

facit 1148 l. $\frac{136}{1288}$

If 10 Bricklayers make a Wall of 100
foot long, and 20 foot high in 12 dayes,
how many Bricklayers will make a wall of
236 foot long, and 20 foot high in 6
dayes?

facit 17 men $\frac{2}{12}$

CHAP. XVII.

A most brief and compendious way of working all manner of questions upon Interest.

Example.

First state your question, thus:

If 100 l. gain 6 l. what the principal?

2. Multiply the second and third numbers together, and divide by your first, which is done by cutting off the 2 first figures of the pounds with a line.

3. Multiply them by 20, by 12, and 4, and all above two figures in each Multiplication carry over the line to the left, as you see in these following Examples.

If 100 l. in 12 months gain 6 l. what will 356 l. gain in 18 months?

If 100 l. gain 6 l. what ——— 356 l.

	l.	s.	d.
12 mo. fa.	21	- 7	- $2\frac{1}{4}$
6 mo. fa.	10	- 13	- 7
	<hr/>		
	32	- 09	$\frac{1}{4}$

	356
	<hr/>
21	36
	<hr/>
	20
7	20
	<hr/>
	12
	<hr/>
	40
2	40
	<hr/>
	4
	<hr/>
1	60

275 l.

375 l. let out for three years, at 6 l. per cent. per annum.

$$100 \text{ ————— } 6 \text{ ————— } 275$$

6

	l.	s.	d.		16	50
a year facit	16	10	0	Then	20	
			3			
3 years will be }					10	00
3 times this sum }						

236 l. 10 s. 5 d. let out for 16 months at 6 l. per cent. per annum.

$$100 \text{ l. ————— } 6 \text{ ————— } 236-10-5$$

mo.	l.	s.	d.		14	19-2-0
fa. in 12-14-3-9 $\frac{3}{4}$						20
$\frac{1}{3}$ 04-14-7 $\frac{1}{4}$						
mo. —————				3	82	
fa. in 16-18-18-5-0					12	
				9	90	
					4	
				3	60	

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Chap. 17. *Interest upon Interest.* 239

The same order observe for Interest upon Interest; only add the last Interest to the third number of the last question, and work as before in these Examples following.

417 l. 11 s. 8 d. let out for four years at 6 l. per cent. per annum, Interest upon Interest.

100 l. ——— 6 l. ——— 417 : 11 : 8
6

25 | 05 : 10 : 0
129

facit 25 l. 1 s. 1 d.

1 | 10
12

1 | 20
4

180

Multiply second and third Numbers together, saying, 6 times 8 pence is 48 pence, which is 4 shillings, set down 0 and carry 4 to the shillings; saying, 6 times 11 is 66, and 4 that I carried is 70 shillings, set down the 10 s. and carry 3 to the pounds, saying, 6 times 7 is 42, and 3 that I carried is 45, set down 5 and

140 *Interest upon Interest.* Chap. 17.
 5 and carry 4, saying 6 times 1 is 6, and
 4 that I carried is 10, set down 0 and car-
 ry 1, saying 6 times 4 is 24, and 1 that I
 carried is 25, which set down, and cut off
 the two first figures of the pounds, & mul-
 tiply as before, and the Product will be ac-
 cording to the Examples, 25 *l.* 1 *s.* 1 *d.* sim-
 ple Interest for the first year; the which
 add to your former principal 417 *l.* 11 *s.*
 8 *d.* and it will make 442 *l.* 12 *s.* 9 *d.*
 Then state your question again, saying,

l. s. d.
 If 100 *l.* ——— 6 *l.* ——— 442 — 12 — 9
6

26 | 55 — 16 — 6
 20

l. s. d. q. 11 | 16
 2d. year 26 — 11 — 1 — 3 12

1 | 98
 4

3 | 92
 l. s. d.

Add this Interest unto the 442-12---9
 and it will make ——— 469 — 3-10

Then

Which
 497 *l.*
 3 *s.* 8
 Interest
 per cent.

Then state your question again, and work as before, saying,

$$100 \text{ l.} \text{ --- } 6 \text{ l.} \text{ --- } 469 \text{ -- } 3 \text{ -- } 10 \frac{1}{2}$$

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
3d. year	28	— 3	— 0 $\frac{1}{4}$	$\begin{array}{r} 28 \overline{) 15-3-4 \frac{1}{2}} \\ \underline{20} \\ 3 \overline{) 03} \\ \underline{12} \\ 0 \overline{) 40} \\ \underline{4} \\ 1 \overline{) 62} \end{array}$

Which 28 *l.* 3 *s.* 0 *d.* $\frac{1}{2}$, add unto the 469--3-10 $\frac{1}{2}$, *facit* 497-6-11. Then state your question again, and work as before, saying,

$$\text{If } 100 \text{ l.} \text{ --- } 6 \text{ l.} \text{ --- } 497 \text{ -- } 6 \text{ -- } 11$$

	<i>l.</i>	<i>s.</i>	<i>d.</i>	
4. year	29	— 16	— 9 $\frac{3}{4}$	$\begin{array}{r} 29 \overline{) 48-1-8} \\ \underline{20} \\ 16 \overline{) 81} \\ \underline{12} \\ 9 \overline{) 78} \\ \underline{4} \\ 3 \overline{) 12} \end{array}$

Which being added to the 497 *l.* 6 *s.* 11 *d.* *facit* 527 *l.* 3 *s.* 8 *d.* $\frac{1}{2}$ Interest upon Interest for 4 years at 6 *l.* *per cent. per annum.*

And

And thus you may in a brief manner work all questions of this nature. Other ways of working there are, of which I shall give you two or three Examples and leave them to your consideration.

Example.

I demand how much the Interest of 819 $l.$ will amount unto for 3 years, 7 months, 18 days, after 6 $l.$ per cent. per annum, Interest upon Interest.

If

Chap. 17. Interest upon Interest. 143

If 100 ——— 106 ——— 819

20

16380

12

196560 d.

106

1179360

1965600

208353 (60

106

1250118

2083530

220854 (18 second year.

106

1325124

2208540

234105 (14 third year.

106

1404630

2341050

248151 (30. 4th year, from

234105 (which subtr. the 3.

14046 one year.

7023-6 mo.

1170-1 mo.

585-15 da.

117-3 da.

8895

234105

facit = 243000 d.

A Table

144 Interest upon Interest. Chap. 17.

A Table to find out what any sum of Money will amount unto for 21 years, or under, at 6 l. in the Hundred, Interest upon Interest.

	<i>l.</i>	<i>s.</i>	<i>d.</i>	<i>q.</i>	
1	1	—	1	—	2-2
2	1	—	2	—	5-2
3	1	—	3	—	9-3
4	1	—	5	—	3-0
5	1	—	6	—	9-0
6	1	—	8	—	4-1
7	1	—	10	—	0-3
8	1	—	11	—	1-2
9	1	—	13	—	9-1
10	1	—	15	—	9-3
11	1	—	17	—	11-2
12	2	—	0	—	2-3
13	2	—	2	—	7-3
14	2	—	5	—	2-2
15	2	—	7	—	11-0
16	2	—	10	—	9-2
17	2	—	13	—	10-0
18	2	—	17	—	0-3
19	3	—	0	—	5-3
20	3	—	4	—	1-2
21	3	—	7	—	11-2

The Table is so plain, that I suppose it needs very little demonstration, I shall therefore only give you one or two Examples.

As,

If you would know what 36 l. comes to, Interest upon Interest, for 20 years.

Look against Number 20 in the first Column and you will find what the Interest upon Interest of one pound comes to for that time. Then say by the Rule of Three,

If 1 l. — 3 l. 4 s. 1 d. 2 q. — 36 l.

82.6 (2)
4444

chap. 17. *Interest upon Interest.* 145
 I desire to know how much 346 pound
 will amount unto in 13 years, Interest up-
 on Interest, at 6 pounds per cent.

Look against Number 13, in the first
 column, and you will find. *l. s. d. q.*
 2 - 2 - 7 - 3

Then say as before,

l. s. d. q. l.
 If 1 be — 2 - 2 - 7 - 3 — 346

20

42

12

511

4

2047 q.

346

12282

8188

6141

708262

896

2 (87708 (5 (1475 | 5
 828 (2 822222

737-15 5 1/2 fa.
 H

A very brief and necessary Table to find out the present worth of the Annuity or yearly Rent for 21 years or under, after the rate of six pound per cent. per annum.

l. s.	d. q.	For the understand	I have
100-18	10-2	ing of this Table, the	worth 6
201-16	8 0	same order is to be ob	nd wou
302-13	5-2	served with the former	question
403-09	3-2	As for Example.	Look
504-04	2-3		nd one
604-18	4-0	If you would know	time 11
705-11	7-3	what one pound yearly	If 1/2
806-04	2-2	rent is worth for 7 year	hall 60
906-16	0-3	in ready money.	
1007-07	3-0		
1107-17	9-2	Look against Num	
1208-07	8-3	7 in the first Column	
1308-17	1-1	and you will find wh	What i
1409-05	11-1	1 pound is worth for	money fe
1509-14	4-1	years, viz. 5-11-7 $\frac{3}{4}$.	er cent.
1610-02	1-0		
1710-09	6-1	Now to know what	
1810-16	6-1	ny other Annuity (as	First se
1911-03	1-3	l. &c.) is worth for t	or 4 year
2011-09	6-0	same time, say by t	
2111-15	2-1	Rule of Three,	Then fa

l. s. d. q. l.

If 1 *l.* be ---5---11---7---3 what 40

l. s. d.

facit 223-5---10

I have a Shop, a Place, or an Office, &c.
worth 60 pound *per annum* for 21 years,
and would sell it for ready money; the
question how much it is worth?

Look against Number 21, and you will
find one pound a year is worth for that
time 11 *l.* 15 *s.* 2 *d.* $\frac{1}{2}$. Then say,

If 1 *l.* be worth -- 11 -- 15 -- 2 $\frac{1}{2}$ what
shall 60 *l.* be?

l. s. d.

facit 705--12--6

What is 10 *l.* *per annum* worth in ready
money for 4 years and $\frac{1}{2}$ to come at 6 *l.*
per cent.

facit 38 *l.* 7 *s.* 7 *d.* $\frac{1}{2}$

First see in the Table what 1 *l.* is worth
for 4 years.

facit 3 *l.* 9 *s.* 3 *d.* $\frac{1}{2}$

Then say if 1 *l.* be worth 3 *l.* 9 *s.* 3 *d.* $\frac{1}{2}$

H 2

what

what shall 10*l.* *facit* 34 *l.* 12 *s.* 11 *d.*

Now to find what the $\frac{1}{2}$ year is worth, see in the Table what 1 *l.* is worth for 5 years

facit 4 *l.* — 4 *s.* — 2 *d.* $\frac{3}{4}$

Then say if 1 — be 4 : 42 $\frac{3}{4}$ — 10

From which subtract the 4th year, & the remains will be for one year, then take the $\frac{1}{2}$ of it w^h. will shew what the $\frac{1}{2}$ year is worth, *fac.*

3 : 14 — 8 $\frac{1}{4}$; which add to the *facit* of the 4th year, and it maketh

5 years 42 : 2 : 3 :

4 years 34 : 12 : 11 :

1 year 7 : 9 : 4 :

$\frac{1}{2}$ a year 3 : 14 : 8 :

38 *l.* — 7 — 7 $\frac{1}{4}$

CHAP. XXVIII.

The Rule of Fellowship without time.

I. **I**N the working of this Rule, there is no difference betwixt it and the Rule of Three, where every mans particular Stock being added together, the total must be the first number in the Rule of Three, the gains the second, and every mans particular Stock the third.

Th

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Two
20 *l.* B
I deman

A 2

B 40

60

If 60

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make up
right.

Chap. 18. *The Rule of Fellowship.* 149

The use of this Rule is therefore to give to each Partner his just and equal share.

Observe then,

II. As the whole Stock is to the whole Gain, so is every mans particular Stock to every mans particular Gain.

Example.

Two Merchants Company, *A* put in 20 *l.* *B* put in 40 *l.* and they gained 50 *l.* I demand each mans part of the gains?

l.

A 20. If 60 *l.* gain 50 *l.* what shall 20 *l.*

B 40

60

l. s. d.
facit 16 13 4 *A*

If 60 *l.* gain 50 *l.* — what will 40 *l.*

l. s. d.
facit 33 6 8 *B*

50-00-00

If both the Shares added together, make up the whole gains, then is the work right.

H 3

Three

30 *The Rule of Fellowship.* Chap. 18

Three Farmers hired a Shepherd to keep their sheep for 7 l. 10 s. per annum.

The first committed 430 Sheep to his care; the second 357 and the third 500 Sheep: I demand how much each man must pay of this 7 l. 10 s?

A must pay 2-10-1
 B must pay 2-01-7
 C must pay 2-18-3

Poof ----7-10-0

Four Merchants ventured to Sea a Stock of 2475 pounds, whereof A put in 710 l. B put in 960 l. C put in 207 l. D put in 598 l. and they gained 2000 l. But tempestuouiness of weather arising, were forced to cast overboard as many goods as amounted to 769 l. I demand what each man must bear of this loss?

l.
 A must bear 220
 B ————— 298
 C ————— 064
 D ————— 185

facit - 769

Chap.

Four these fe
 120 l.
 in 210
 of Fruit
 demand

Three
 put in a
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 B and C

Four

18
Chap. 18. *The Rule of Fellowship.* 151

Four Grocers laid in a Stock containing these several sums following. *A* put in 120 *l.* *B* put in 136 *l.* *C* put 180 *l.* *D* put in 210 *l.* and with it they bought a parcel of Fruit, by which they gained 398 *l.* I demand each mans part of the gains?

	<i>l.</i>		
Answer {	<i>A</i> — 73	⁶⁰² ₆₄₈	602
	<i>B</i> — 83	⁵¹⁰ ₆₄₈	510
	<i>C</i> — 110	⁵⁸⁰ ₆₄₈	580
	<i>D</i> — 129	²⁴⁶ ₆₄₈	246
<hr/>			
	398		1938
			848
			(3 <i>l.</i>

Three Merchants made a Company, *A* put in a certain sum of money. *B* put in as oftentimes 5 *l.* as *A* put in 4 *l.* *C* put in as oftentimes 7 *l.* as *B* put in 6 *l.* and they have gained together a certain sum of money, whereof *A* his part is 100 *l.* I demand *B* and *C* part and whole gains?

4	—	100	—	5	facit	125	<i>B</i>
6	—	125	—	7	facit	145	<i>C</i>
					facit	100	<i>A</i>

H 4

370 ¹/₂
Two

152 *The Rule of Fellowship.* Chap. 18

Two Merchants made a Company, *A* put 350 *l.* and they gained together 196 *l.* of which *B* must have so often times 10 *l.* as *A* must have 6 *l.* I demand how much money *B* put in the Company

Alwayes observe that every man must have according as he hath put in, then consider if 6 ————— 350 ————— 10

l.
facit 583 $\frac{1}{3}$ *B* put in.

Two men Company, and make a Stock of 700 *l.* whereof *A* put in 300 *l.* and they have gained together 240 *lb.* I demand what each man must have of the gains?

facit 102 - 17 - 1 $\frac{2}{7}$ *A*

facit 137 - 02 - 10 $\frac{2}{7}$ *B*

240 - 00 - 00

Three Merchants made a Company, *A* put in 600 *l.* *B* put in so oftentimes 50 *s.* as *A* put in 40 *s.* *C.* put in so oftentimes 70 *s.* as *B.* put in 60 *s.* and they gained

Chap. 18

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If —

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2 222
3 222

Chap. 18. *The Rule of Fellowship.* 153

gained together 500*l.* I demand what each man put in, and must have of the gains?

In questions of this nature, the particular Stocks unmentioned, must be found out by that which is mentioned.

As for Example: To find what Stock *B* put in.

$$\begin{array}{r} \text{If} \text{---} 4 \text{---} 600 \text{---} 5 \\ \text{facit} \text{---} 750 \text{ } l. \text{ } B \end{array}$$

Such reason as 6 hath to the money which *B* put in, such reason must 7 have to the money which *C* put in; as,

$$\text{If} \text{---} 6 \text{---} 750 \text{---} 7$$

$$\begin{array}{r} \text{facit } 875 \text{ } C \\ 600 \text{ } A \\ 750 \text{ } B \\ 875 \text{ } C \\ \hline 2225 \end{array}$$

$$\begin{array}{r} \text{1 } 2225 \text{---} 500 \text{---} 600 \text{ } A \\ \text{2 } 2225 \text{---} 500 \text{---} 750 \text{ } B \\ \text{3 } 2225 \text{---} 500 \text{---} 875 \text{ } C \\ \hline 2225 \end{array}$$

H 5

Three

154 *The Rule of Fellowship.* Ch. 18.

Three Merchants made a Company, D put in 437 *l.* E put in 211 *l.* and they have gained together 562 *l.* whereof F must have 187 *l.* 15 *s.* I demand D and E part, and what F put into Company?

To find what F put in, first subtract his particular gain from the whole gain.

$$\begin{array}{r}
 \textit{l.} \quad \textit{s.} \\
 562 - 00 \\
 187 - 15 \\
 \hline
 374 - 05 \\
 \hline
 \end{array}$$

Then add D and E Stock together,

$$\begin{array}{r}
 437 \textit{ D} \\
 211 \textit{ E} \\
 \hline
 648 \\
 \hline
 \end{array}$$

Gain,	Stock,	Gain.
474 <i>l.</i> 5 <i>s.</i>	648 <i>l.</i>	187 <i>l.</i> 15 <i>s.</i>

facit 325 ⁸¹⁵ 7485

Then to find D and E part of the profit.

Stock,	<i>l.</i>	<i>s.</i>	Stock.
648	374	5	437 <i>D</i>
648	374	5	211 <i>E</i>

Chap.

III.
with the
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is multi
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IV.
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Two M
for 4
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D
E

Fel

Fellowship with Time.

III. The use of this part is the same with the former, and differeth not in operation, save in this that every mans Stock is multiplyed by his time, and the total of those products added together is the first Number, the gain or loss the second Number, and every mans particular stock and time the third.

Observe then.

IV. *As the whole stock and time is to the whole loss or gain;*

So is every mans particular stock and time to every mans particular loss or gain.

Example.

Two Merchants Company, D put in 100
l. for 4 months. E put in 136 l. for 3 mo.
and they gained 50 l. I demand each mans
part of the gains?

Mo.

D put in 100 l. 4 — 400

E put in 136 l. 3 — 408

808

308

l.

808	—	50 l.	—	400	facit	24
808	—	50 l.	—	408	facit	25

50

Three Butchers hired a piece of ground for 12 l. 10 s. 6 d. A put in 20 Oxen 5 dayes, B put in 16 Oxen seven dayes, C put in 25 Oxen 4 dayes. I demand how much each Butcher ought to pay for his proportion?

Ox. Da.

A put in	20	—	5	—	100
B put in	16	—	7	—	112
C put in	25	—	4	—	100

312

l. s. d.

312	—	12 - 10 - 6	—	100
-----	---	-------------	---	-----

l. s. d.

facit 4 - 0 - 3

312	—	12 - 10 - 6	—	112
-----	---	-------------	---	-----

facit 4 - 9 - 11

312	—	12 - 10 - 6	—	100
-----	---	-------------	---	-----

facit 4 - 0 - 3

Proo

Three
first of
B put
of Ap
til the
I dem

Proo

Ch. 18. The Rule of Fellowship. 157

l. s. d.

A 403 144

312

B 49 11 24

312

C 403 144

312

Proof-12:10:6 $\cancel{882}$
 $\cancel{882}$ (1

Three Merchants Company, A put in the first of January 120 l. until March the 22. B put in 176 l. the 10. of Feb. until the 12 of April: C put in 295 l. the 2^d of Feb. until the 25 of April, and they gained 800 l. I demand each mans part of the gains?

l. 7596

A must have 174 44646

16768

B must have 192

44646

20282

C must have 433

44646

Proof ---- 800

~~***~~

(1

~~***~~

Three

158 *The Rule of Fellowship.* Chap. 18.

Three Merchants Company for 18 mo.
D put in 500 *l.* and at 5 mo. took out 220 *l.*
 and at 10 mo. put in more 300 *l.* and at
 14 mo. took out 130 *l.* *E* put in 400 *l.* and
 at 3 mo. put in more 270 *l.* and at 9 mo.
 took out 140 *l.* and at 12 mo. put in more
 100 *l.* and at 15 mo. took 99 *l.* *F* put in
 900 *l.* and at 6 mo. took out 200 *l.* and at
 11 mo. put in 500 *l.* and at 13 mo. took
 out 600 *l.* and they gained 200 *l.* I de-
 mand each mans part of the gains?

D must have 50 *l.* 12350

32873
 20474

E must have 62 32873

49
F must have 87

32873

Proof — 200 32873
 32873 (1

Two men made a Stock of 165 pound,
 wherewith they gained 28 pound, which
 added to the stock makes 193 pound.
D his money was in 12 months, and
E

Ch. 1

E his
 share
E 12
 stock

E
 and
 stock,

l.
 55
 55

mo.
 12

So
 & with

Ch. 18. *The Rule of Fellowship.* 159

E his money was in but 8 mo. When they shared the stock and gain, D had 67 l. and E 126 l. I demand what was each mans. stock?

State your question thus.

$$\begin{array}{rclcl}
 \text{mo.} & & \text{l.} & & \text{mo.} \\
 \text{If } 12 & \text{---} & 165 & \text{---} & 8 \\
 & & & & \text{facit } 110 \text{ l. for}
 \end{array}$$

E stock, the which subtract from 165 and the remainder will be 55 lb. for D stock.

The Proof.

$$\begin{array}{rclcl}
 \text{l.} & \text{mo.} & \text{l.} & & \text{l.} & \text{mo.} \\
 55 \text{ in } 12 & \text{gain } 12 & \text{what } 110 & \text{in } 8 \\
 55 & \text{---} & 12 & \text{---} & 110 \\
 & & & & \text{facit } 24 \text{ l.}
 \end{array}$$

$$\begin{array}{rclcl}
 \text{mo.} & & \text{l.} & & \text{mo.} \\
 12 & \text{---} & 24 & \text{---} & 8 \\
 & & & & \text{facit } 16 \text{ l.}
 \end{array}$$

So that D with 55 l. stock, gains 12 l.
E with 110 gains 16 l.

$$\begin{array}{r}
 \text{---} & 12 \\
 165 & \text{---} \\
 & 28
 \end{array}$$

CHAP.

C H A P. XIX.

Of Barter.

Barter is the exchanging Wares for Wares, or one commodity for another

Example.

Two Merchants Barter, *A* hath 3 C¹/₂ of Pepper at 13 d. ¹/₂ per pound, *B* hath Ginger at 15 d. ¹/₄ per pound. I demand how much Ginger must be delivered for the Pepper?

1. See what the Pepper is worth; saying,
If 1 l. cost 13 d. ¹/₂ - what cost 3 C. ¹/₂.

facit 22 l. 1 s.

2. Say, If 15 d. ¹/₄ buy 1 lb. of Ginger, what will 22 lb. 1 s. buy?

facit 347 ¹/₈ Ginger.

Two men Barter, *A* hath 20 Ells of Cloth at 9 s. 6 d. per Ell ready money, but in Barter he will have 10 s. 2 d. per Ell, *B* hath Jersey Wooll at 2 s. 10 d. per pound. I demand how much Wooll must be delivered for the Cloth in Barter?

As

As before so here,

If 1 Ell in Barter be 10 s. 2 d. what 20 Ells in Barter ?

facit 2440 d.

If 34 d. buy 1 lb. what will 2440 d. buy?

facit 71 lb. $\frac{13}{17}$

Two Drapers Barter, the one hath 472 yards of Canvis at 16 d. per yard, the other lets him have 38 pieces of Cloth: the question is, how much one Cloth stands him in.

facit 16 s. $\frac{1}{2}$

20 Bags of Hops, each 3 C $\frac{1}{2}$ bartered for 336 C of Brazil, at 18 s. a C. I demand what price were the Hops sold at ?

Answer 4 l. 6 s. $\frac{14}{35}$ per C

A Merchant hath Tobacco, which he will barter at 14 d. per l. for Sugar at 10 d. per l. in barter. I demand how much Tobacco must be given for 8900 lb. of Sugar ?

Answer 357 lb. $\frac{1}{2}$

Nutmegs

Nutmegs at 4 s. 2 d. per lb. ready money, 5 s. in Barter, how must Pepper at 12 d. per lb. be sold to make the like profit?

Answer 14 d. $\frac{2}{3}$.

How many dozen of Candles at 5 s. 2 d. per doz. must be given for 3 C. 2 qrs. 16 lb. of Tallow, at 37 s. 4 d. per C.

Answer 26 doz. $\frac{11}{12}$.

A Merchant hath Stockings at 39 s. per doz. ready money, which he will barter at 46 s. per doz. for Canvis, at 13 d. $\frac{1}{2}$ per Ell ready money. I demand what price the Canvis must bear in barter, to gain 5 l. in the 100 l.

Answer 16 d. $\frac{1}{2}$ and $\frac{7}{35}$ of $\frac{1}{2}$ d.

Broad Cloth of 6 s. 8 d. the yard ready money is bartered at 7 s. 9 d. for Wooll at 10 d. per l. ready money: What price must be made of the Wooll in barter to gain 10 l. per cent.

Answer 12 d. $\frac{61}{60}$.

D hath Holland of 5 s. per Ell ready money, bartered at 6 s. per Ell to E for broad Cloth, at 9 s. 6 d. per yard, which cost

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I. T
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If the

A Mer

payment
6 mo. an

agrees to
payment

time tha
without
bu

but 8 s. I demand which gaineth most, and how much *per cent.*

Answer, *D* gains 20 *l.* *per cent.*

E 18 *l.* 15 s. *per cent.*

CHAP. XX.

Of Equation.

I. **T**He Rule of Equation of payments teacheth to reduce the times of several particular payments, to one time for the payment of the whole sum.

Example.

If the question be of this Nature.

A Merchant oweth 500 *l.* to be paid at 3 payments, *viz.* 300 *l.* at 4 months, 100 *l.* at 6 mo. and 100 *l.* at 12 mo. The Debtor agrees to discharge the whole debt at one payment. Now the question is, at what time that payment ought to be made, without damage unto the Debtor or Cre-

Creditor, accounting 6 l. per cent. per annum, Interest.

The Rule is this.

II. Multiply each particular payment by its time, then add all the Products together, and divide the total by the whole Debt.

<i>l.</i>	<i>Mo.</i>	
300	multiplied by 4	<i>facit</i> 1200
100	multiplied by 6	<i>facit</i> 0600
100	multiplied by 12	<i>facit</i> 1200
<hr/>		<hr/>
<i>Divisor</i> 500		<i>Dividend</i> 3000
	<i>8888</i>	<i>(6</i>
	<i>888</i>	

So that the answer to the question (according to this Rule) is, that six months is the time for the payment of the whole sum.

III

III. *For the Proof of this Rule, thus:*

300 *l.* ought to be paid at 4 months, and is not paid till 6 months, that is 2 months after its time. The Interest of 300 *l.* for 2 mo. is 3 *l.*

Then 100 *l.* paid at 6 months is the time Equated.

The other 100 *l.* to be paid at 12 mo. is paid 6 months before its time; and the Interest thereof for 6 months, is likewise 3 pound.

Which sheweth the Rule to be true, and that six months is the time for the payment of the whole sum, and thereby neither the Debtor nor Creditor is damaged according to the Law.

A Merchant oweth 450 *l.* to be paid at 3 payments $\frac{1}{3}$ at 3 months $\frac{1}{3}$ at 5 mo. and $\frac{1}{3}$ at 8 mo. and the Debtor and Creditor agree, that the whole sum shall be paid at one time: The question is, what time ought the whole some to be paid in; so that neither the one nor the other may be damaged?

The

The Rule is to multiply each part by its time, thus :

$$\begin{array}{r} 3 \\ \hline \frac{1}{3} \text{ by } \frac{3}{1} \text{ facit } 1 \text{ mo.} \end{array}$$

$$\begin{array}{r} 3 \\ 5 \\ \hline \frac{1}{3} \text{ by } \frac{5}{1} \text{ facit } 1 \text{ mo. } \frac{2}{3} \end{array}$$

$$\begin{array}{r} 3 \\ 8 \\ \hline \frac{1}{3} \text{ by } \frac{8}{1} \text{ facit } 2 \text{ mo. } \frac{2}{3} \end{array}$$

3

facit - 5 mo. $\frac{1}{3}$

A Merchant oweth 300 *l.* to be paid $\frac{1}{3}$ at 3 months, $\frac{2}{3}$ at 6 mo. and $\frac{1}{3}$ at 12 mo. I demand at what time the said sum ought to be paid altogether?

3	Mo.)
3	
$\frac{1}{3}$ by $\frac{2}{1}$ facit	1
3	
6	
3	
$\frac{1}{3}$ by $\frac{6}{1}$ facit	2
3	
12	
3	
$\frac{1}{3}$ by $\frac{12}{1}$ facit	4
3	
facit 7 mo.)	

To prove the certainty of this manner of operation you may take the same course as before, 7 months being the time for payment of the whole sum.

See first what the Interest of the money comes to, that should have been paid before the 7 months : and then see what the Interest of the money comes to that should have been paid after the 7 months ; and if the Interest of the one part be equal with the Interest of the other, then is the former operation right ; and 7 months must needs be the just time. As for Example.

100 £. should have been paid at 3 months, but now is not paid till 7 mo.

mo. so that the Interest for that 100 *l.* must be accounted for the 4 months delay, which Interest is ——— 2 *l.* ——— 00 *s.*

100 *l.* more should have been paid at 6 mo. and now is delayed till 7 mo. The Interest for that is ——— 0 ——— 10

facit — 2 — 10

The other 100 *l.* is paid 5 mo. before its time, and the Interest thereof for 5 mo. is likewise — 2 *l.* — 10 *s.* equal with the former, which shews the operation to be right.

There is owing to a Merchant 340 *l.* to be paid, 80 pound ready money, 100 *l.* at 3 mo. and 160 *l.* at 8 mo. I demand what is the indifferent time for the payment of the whole?

IV. In Questions of this nature, set down the particular sums, and the several times of payment, thus:

<i>l.</i>	<i>Mo.</i>
80 ———	00
100 ———	03
160 ———	08

Then multiply each summe by its time of payment, and the work will stand

And thus. Add all the products together,
and divide the total by the whole Debt.

<i>l.</i>	<i>Mo.</i>
8	0—0—00 0
10	0—0—30 0
16	0—0—128 0

34 Divisor. 158 Dividend.

(22 Mo.

$$xss (4 \frac{11}{17} \text{ facit.})$$

34

There is 245 *l.* 10 *s.* 9 *d.* to be paid $\frac{1}{2}$ at 6 mo. $\frac{1}{3}$ at 8 mo. and the rest at 12 mo. what is the indifferent time for the payment of the whole sum together?

This Rule is laid down in the first and second Examples. Multiply each part by its time.

by 6 *facit* — 3
by 8 *facit* — 2 $\frac{1}{3}$
by 12 *facit* — 2
—
facit Mo. 7 $\frac{1}{3}$

The certainty hereof
is demonstrated by the
proof of the third Ex-
ample.

its A is indebted unto B 300 $l.$ to be
will paid 100 $l.$ at 4 mo. and 200 at 8 mo.
and I And

And *B* oweth unto *A* 500 *l.* to be paid at 10 months. It is agreed between them that *A* shall make present pay of his whole Debt, and *B* shall pay his so much the sooner, as shall countervail that favour. I demand at what time *B* must pay 500 *l.* reckoning simple Interest?

V. For the Resolution of this, and the like Questions, first see by the former Rule what time *A* ought to pay in his whole money.

	Mo.
1 00 — at 4 — 4	
2 00 — at 8 — 16	
31	(2
	$\frac{20}{8} (\frac{1}{4} \text{ facit.})$

Then say by the Rule of Three.

If 3 ————— 6 $\frac{1}{4}$ ————— 5
$\frac{20}{8} (4 \text{ mo. facit.})$

Which 4 mo. is to be subtracted from 10 mo. (the time that *B* ought to have paid in his money) and there remain months.

Observ

Observe. For the proof hereof, see first what the Interest of 300 *l.* comes to for 6 mo. $\frac{2}{3}$.

Then see what the Interest of 500 *l.* comes to for 4 mo. If both the sums be alike, then is the former work true.

A Merchant hath a certain sum of money owing to him, to be paid at 7 mo. his Debtor doth agree to pay him $\frac{1}{2}$ ready money, and $\frac{1}{3}$ at 4 mo. I demand what time he must have to pay in the rest, so that neither party may have advantage of the other, without reckoning Interest upon Interest? —

VI. For the Resolution hereof, it matters not what the sum was, but you may work the same by any number that will easily admit of the parts mentioned in the Question. And for our present use, we will imagine the sum that was to be paid at 7 mo. was 60 *l.*

Whereof $\frac{1}{2}$ that is 30 *l.* must be paid content.

And $\frac{1}{3}$ which is 20 *l.* must be paid at 4 months; then see what the Interest of these two parts come to, for the time in which they were paid before they were due.

The Interest for 30 l. for 7 mo. is
-- 21 s.

The Interest for 20 l. for 3 mo. is
-- 06 s.

facit 27 s.

Now that which remains for a full resolution of the question, is only this :

To find out how long time the remaining part of the sum (which is 10 l.) must be retained, that the Interest thereof may come to 27 s.

And that is done by the Rule of Three, Thus :

The Interest of 10 l. for 1 mo. is 1 s.

If ——— 1 s. ——— 1 mo. ——— 27 s.

Unto which add the
7 mo. allowed at first. 07

facit 35 Mo.

A Merchant hath owing him 500 l. to be paid him at 8 mo. and his Debtor doth agree to pay him 200 l. at 3 mo. on condition that he shall let him have the rest for so much the longer : the question is, When he must pay the rest—with Interest upon Interest ?

Chap. 20.

Equation.

173

As in the former question, so in this:
First, see what the Interest of 200 *l.* comes
to for 5 mo. paid before the time.

The Interest of 200 *l.* for 5 mo. comes
to $-5^l. - 00 s. - 00 d.$

Then by the Rule of Three, see how ma-
ny months 300 *l.* - 00 *s.* - 00 *d.* must be
let out, that so the Interest thereof may
come to 5 *l.*

To which add the *facit* 3 mo. $\frac{1}{3}$.
8

facit 11 $\frac{2}{3}$

A Merchant hath owing to him 146 *l.*
10 *s.* 9 *d.* to be paid $\frac{1}{3}$ content $\frac{1}{4}$ at 3 mo.
 $\frac{1}{3}$ at 5 mo. and the rest at 7 mo. And his
Debtor doth agree to pay him all at one
payment. I demand when that payment
must be made that neither have advan-
tage of the other?

	mo.	mo.
$\frac{1}{3}$ at	0	0
$\frac{1}{4}$ at	3	0 $\frac{3}{4}$
$\frac{1}{5}$ at	5	1
$\frac{1}{6}$ at	7	1 $\frac{1}{6}$

facit 3 mo. $\frac{4}{15}$

A Merchant hath owing 243 *l.* 19 *s.* 11 *d.* to be paid $\frac{1}{2}$ at 2 mo. $\frac{1}{4}$ at 3 mo. and the rest at 6 mo. The Debtor doth agree to pay $\frac{1}{2}$ content, and the other half at one payment. I demand when the payment must be made, that neither may be damaged?

First, Do according to the former Rule, What is the indifferent time for the payment of the whole sum together?

	Mo.
$\frac{1}{2}$ at	— 2 — 0 $\frac{1}{4}$
$\frac{1}{4}$ at	— 3 — 1
$\frac{1}{2}$ at	— 6 — 3
	<hr style="width: 100%; border: 0.5px solid black;"/>
	<i>facit</i> 4 mo. $\frac{1}{4}$

Now in regard that $\frac{1}{2}$ is paid in 4 mo. and $\frac{1}{4}$ before it is due, it is reason, and according to Rule, that he should have the other $\frac{1}{2}$ 4 mo. $\frac{1}{2}$ longer, which being added to the just time of payment,

facit 8 mo. $\frac{2}{4}$

CHAP.

C H A P. XXI.

The Rule of Rebate or Discount.

Rule, I. **M**erchants commonly vend their Commodities either for ready money, or to be paid at a certain time or times appointed, as 3, 4, 6, 12, mo. or the like; but it often happeneth to be very convenient both to the buyer and seller, that this money be paid in before it be due.

As for Example.

A Merchant sells goods to the value of 100 £. to another, to be paid at 12 mo. but the other is willing upon an after agreement to pay present money upon Rebate, after 6 pound *per cent. per annum*, simple Interest. I demand the sum paid, and rebated?

Observe. Before you lay down the manner of working, observe that in all Rebate-ments, there ought to be no more money paid then would augment itself to the sum first due (if it were put forth to Interest, and this may also serve as a sure proof of this Rule.

176 *The Rule of Rebate.* Chap. 21.

How to state the Question.

1. First see what the Interest of 100 l. cometh to for the time demanded.

2. Add that Interest to the 100 l. which must be the first number in the Question; 100 l. the second, and the sum to be Rebated the third.

Example.

l. l. l.
If 106 — 100 — 100
100

10000

(3
45 (6
x0000 (94 l. $\frac{13}{31}$ fac.
x000
x0

Which put
forth to In-
terest, would
become 100 l.

I demand how much the rebate of 289 l. 19 s. will amount unto for 6 months, after 8 pounds per cent. per ann. simple Interest?

l. l. l. s.
104 — 100 — 289 — 19
20
5799
1
579900

(1

100 l.
 which
 tion;
 e Re.

$\begin{pmatrix} 1 \\ 0 \end{pmatrix}$
 $88762(0$
 $879900(55715$
 804444
 $8000\ 278-15-\frac{25}{28}$
 xx

	l.	s.	d.
Was to be paid	289	19	0
Is to be paid	278	15	$\frac{25}{28}$
Is Rebated	11	3	$\frac{1}{28}$

I demand the Rebate of 321 l. 18 s. for 11 months, after 6 pound per cent. per an. simple Interest.

put
 In-
 ould
 00 l.
 9 l.
 fter
 est?

To find the Interest of 100 l. for any number of mo. you may take the parts of 12 months, as thus; If 6 l. be the Interest of 100 l. for 12 mo. then 6 mo. will be the $\frac{1}{2}$ of that; 3 mo. the $\frac{1}{4}$ of that $\frac{1}{2}$, and 2 mo. the $\frac{1}{3}$ of that for 6 months.

Example.

mo. l.

11 — 6

6 — 3

3 — 1-10

2 — 1

5 l. 10 s.

105 l. — 10 s. — 100 l. — 321 l. — 18 s.

facit 305 l. — $\frac{25}{28}$

I 5

I

178 The Rule of Rebate. Chap. 21.

I demand the Discount of 378 pound for 2 : 6 mo. after 6 pound per cent. per annum, simple Interest ?

By 2 : 6 mo. is understood that the one $\frac{1}{2}$ of the money is to be paid at 6 mo. and the other $\frac{1}{2}$ at 6 mo. after that.

l.	l.	l.
103	100	189
		facit 183 l. ⁵¹ / ₁₀₀
l.	l.	l.
106	100	189
		facit 178 l. ¹⁸ / ₁₀₀

I demand the Discount of 760 l. 16 s. for 3 : 4 mo. after 6 pound per cent. per annum, simple Interest ?

Mo.	l.	l.	s.
12	6	760	16
4	2	253	12
8	4	253	12
12	6	253	12

102 — 100 — 253 l. — 12 s.
facit 248 l. ⁵¹/₁₀₀ for the first payment at 4 months.

Chap. 21. *or Discount.* 179

104 l. — 100 — 253 l. — 12 s.
facit 243 l. $\frac{11}{4}$ for the second payment
 at 8 months.

106 l. — 100 — 253 l. — 12 s.
facit 239 l. $\frac{11}{4}$ for the third payment
 at 12 months.

There are other wayes for the working
 of Rebate, but I shall only instance one
 more after 6 l. per cent.

As first multiply the money and the time.
2ly. Divide that product by 200 and the
Time, and the Quotient is the sum to be paid
upon Rebate. Example.

What is the Rebate of 100 l. for 12 mo.
 after 6 l. per cent. per annum?

$$\begin{array}{r}
 100 \\
 12 \\
 \hline
 1200 \quad (1 \\
 \quad \quad (4 \quad l. \\
 \quad \quad \quad 200 \quad (0 \quad \left(\begin{array}{c|c|c} 5 & 140 & 70 \\ \hline 212 & 106 & 35 \end{array} \right. \\
 \quad \quad \quad 212
 \end{array}$$

100 was to be paid.

$5 \frac{35}{106}$ is to be Rebated.

l. 94 $\frac{14}{106}$ is to be paid.

And thus you may work any other que-
 stion after 6 per cent. &c.

But if the Rebate be after 8 l. per cent.
 then let the Divisor be 150 and the time.

CHAP.

CHAP. XXII.

Of Exchange.

I. **T**HE whole course of Exchange is no more than to pay money in one place or Country, and receive in another the like value or sum, with consideration of either loss or gain.

I might give you a Catalogue of Foreign Coynes, but it will be to little purpose, because they are not current money as our *English* is, but do rise sometimes higher in value, and sometimes lower, according as the Exchange runs. I shall therefore give you some choice questions, and so leave you to enlarge as you see occasion.

A Merchant delivered 340 *l.* Sterling at *London* to receive the same at *Amsterdam*, the Exchange at 34 *s.* 7^d. Flemish, the 20 *s.* Sterling. I demand the same in Flemish money?

II. Consider that first and third numbers must be of one kind; if the first be Sterling money, the third must be so too: if the first Flemish, the third must be Flemish.

If

Chap. 22. Of Exchange.

181

	<i>s.</i>	<i>s.</i>	<i>d.</i>	<i>l.</i>
If 20	—	34	— 7	— 34 ^o
		12		20

415
6800

6800

332000

2490

282200|0

$\frac{1}{12}$ 141100 *d.*

1175|8-4 *d.*

facit — 587 — 18 — 4

Or thus,

34^o *l.* at 34 *s.* 7 *d.*

34

1360

10200

170

28-4 *d.*

1175|8

587-18-4 *facit.*

If

A

A Merchant received a Bill of Exchange of 8000 Crowns at $5\ s. \frac{2}{3}$ Ster. I demand the sum in Sterling money?

Say

If 1 be ——— $5\ s. \frac{2}{3}$ what ——— 8000
facit 45714 s.

A Merchant delivered 245 l. *Flem.* at *Middleborough* to receive the same at *London*, the Exchange at 29 s. and 5 d. *Flem.* the 20 s. Ster. I demand the sum Sterl. money?

If 29 s. 5 d. *Flem.* be 20 s. Ster. what 245 l. *Flem.*

facit 166 l. 11 s. $\frac{157}{157}$

A Merchant of *London* receiveth a Bill of Exchange from *Paris* 460 l. Sterling, for the value delivered there at 84 d. Sterling, the 60 s. Tournois. I demand how much was delivered at *Paris* Tournois?

84 d. ——— 60 s. ——— 460 l.
facit 1314 s. $\frac{2}{7}$

A Merchant at *London* delivered 80 l. Ster. by Exchange for *Frankford* at 40 d. Ster. the Florine of 67 *Krentzers*. The question is, in how many Florines of 63 *Krentzers* the Florine, he must receive at *Frankford*?

$$\begin{array}{r}
 (4 \\
 67 \\
 63 \\
 40 d. \text{ --- } 1 \frac{4}{8} \text{ --- } 80 l. \\
 \text{facit } 510 \frac{19}{32}
 \end{array}$$

A Merchant at *Danzick* doth receive a Bill of Exchange from *London* 3999 Florins, and is for 376 l. Sterl. delivered at *London*. I demand at what price the pound Sterl. was delivered, when 30 gross Polish make a Florine?

facit 319 $\frac{11}{32}$ gr. Polish.

At *Antwerp* a Merchant receiveth a Bill of Exchange from *London* of 375 l. *Flem.* for the value received there at 27 s. 5 d. *Flem.* the 20 s. *Ster.* I demand the sum in *Ster.* money that was delivered at *London*?

facit 273 l. — 11 $\frac{41}{11}$

A Merchant at *London* doth deliver 370 l. Sterling by Exchange for *Roan* at 73 d. Sterling for 50 s. Tournois. The demand is, how much he must receive at *Roan* Tournois?

facit 60821 s. Turnois.

184 *Of Exchange.* Chap. 22.

A Spanish Merchant doth receive a Bill of Exchange from *London* of 700 Duc-kets, and is for 196 *l.*—15 *s.* delivered at *London*. I demand at what price the Duc-ket was delivered?

facit 5 *s.* $\frac{87}{148}$

III. *How to know at what rate we make the Exchange transporting Money or Wares from one Countrey to another.*

If a Ducket of *Venice* be worth 120 *s.* and at *London* 5 *s.* 7 *d.* At what price is the Exchange made for the Ducket of 112 *s.* in transporting from *Venice*?

120 ——— 5 *s.* — 7 *d.* ——— 112
facit 5 *s.* 2 *d.* $\frac{8}{15}$

If a *French Crown* at *Hamborough* be worth 5 *s.* Lubish, and an Angel be worth 78 *s.* and at *London* a *French Crown* is worth 6 *s.* *Sterling*, and the Angel 11 *s.* *Sterling*. Whether is it better to bring Angels or *French Crowns* from *Hambo-rough* to *London*?

It is better to bring *French Crowns* by $\frac{27}{28}$.

If a piece of *Searge* be worth 28 *s.* *Ster-ling*. And at *Frankford* it is worth (all charges

Chap. 22. Of Exchange. 185

charges abated) 17 Florins at 60 Kreuzers the Florine. At what price do I make the Exchange for 66 Kreuzers in carrying Searges from London to Frankford?

facit 1 s. $\frac{212}{33}$

If a Mark at Hamborough be worth 33 s. Lubish, and at London 3 s. 7 d. At what price is the Exchange made in bringing Marks from Hamborough to London?

facit 184 s. $\frac{8}{41}$ Lubish.

If a French Crown be worth 7 s. $\frac{3}{5}$ Flem. at Antwerp, and 6 s. at London. At what price do I make the Exchange in bringing French Crowns from Antwerp to London?

facit 25 s. $\frac{1}{3}$ Flem.

If a Dollar at Dantzick be worth 39 Gross, and at London 4 s. 8 d. at what price do I make the Exchange for one pound Sterling, transporting Dollars from thence to London?

facit, 167 $\frac{3}{38}$ Gross.

CHAP.

CHAP. XXIII.

Of Loss and Gain.

I. I Need not go about to acquaint you with the meaning of this Rule, because the words themselves are sufficient to inform you. And for its nature, I shall shew it you by many and various Questions, which indeed are something hard to apprehend, without the well-minding of these four principal heads, which being well understood, will carry you through the difficulties thereof.

As,

First, To know what is gained or lost *per cent.*

Secondly, To know how it shall be sold for to gain or lose so much *per cent.*

Thirdly, Having gained or lost so much *per cent.* to know what it cost.

Fourthly, There being so much gained *per cent.* when sold for such a rate; To know what is gained *per cent.* when sold for more, or what is lost *per cent.* when sold for less.

Of

Of these in order.

First, To know what is gained or lost per cent. per Pound, per Ell, per Yard, &c.

Example.

If 1 lb. of Tobacco cost 18 d. and is sold for 21 d. I demand how much is gained per cent? First, see what the Gain or Loss is by Subtraction.

21

18

3

Then let the price it cost be the first number in the Rule of Three, the Gain or Loss the second, and 100 l. the third.

18 gain ——— 3 d. ——— what 100
facit 16 l. 13 s. 4 d.

If a Leatherfeller buy a parcel of Leather for 2 s. 10 d. per Skin, and selleth the same gain for 3 s. 2 d. what doth he gain per cent?

3 s. 2 d. If 34 d. gain 4 d. — what 100 l.
2 ——— 10
facit 11 l. 15 s. 3 d. $\frac{2}{3}$

0 ——— 4

IF

If I buy an Ell of Holland for 6 s. 7 d. and sell it again for 5 s. 9 d. I demand how much the loss is *per cent*?

$$\begin{array}{r} s. \quad d. \\ 6-7 \\ 5-9 \\ \hline \end{array}$$

If 6 s. 7 d. ——— 10 d. ——— 100 l.
facit 12 l. - 13 - 01 d. ⁷⁷/₇₉

If 1 lb. cost 10 d. and is sold again for 8 d. the question is, what is lost *per cent*?

If 10 d. lose ——— 2 d. what 100 l.
facit 20 l.

If a piece of Cloth contain 24 Yards, cost 42 s. and one yard is sold for 2 s 8 d. the question is, how much is gained or lost *per cent*?

Gained 52 l. 07 s. 7 d. $\frac{3}{7}$ *per cent*.

If a piece of Silk contain 36 yards, cost 9 l. and one yard is sold for 9 s. 8 d. I demand whether I win or lose, and how much *per cent*?

facit 39 l. - 06 s. - 08 d. gain.

A Draper hath a piece of Cloth-containing 30 yards cost him 14 s. the yard, and another Cloth containing 19 yards cost 7 s. the yard, and he sells them one with another for 13 s. the yard: I demand whether he

Chap. 23. *Loss and Gain.* 189

he doth win or lose, and how much *per cent*?

- $1 \frac{5}{7}$ *facit* gains *per yard*.
facit 15 l. - 03 s. -- 09 $\frac{2205}{387}$ gains in Ell.

If 1 yard cost 3 s. ready money, and is sold again for 3 shil. 4 d. for 8 mo. I demand how much is gained *per cent. per an.* without Interest upon Interest?

facit 16 l. - 13 s. 4 d. gains.

If one yard cost 9 s. ready money, and is sold for 8 s. the yard, for 16 mo. the question is, how much is lost *per cent. per an.* without loss upon loss.

$\left\{ \begin{array}{l} \text{facit 11 l. - 2 s. - } \frac{2}{3} \text{ for 16 mo.} \\ \text{Lost 8 l. - 6 s. - } \frac{1}{3} \text{ for 12 mo.} \end{array} \right.$

If I buy Cloth for 6 s. a yard for 8 mo. and sell the same again for 5 s. 6 d. ready money, how much do I lose *per cent. per annum*?

Questions of this nature are to be resolved at 2 workings by the Rule of Three thus,

If 6 s. lose — 6 d. — what 100 l.
facit 2000 d.

If 8 mo. lose 2000 d. — what 12 mo.
facit 12 l. 10 s.

If

If I buy Cottons for 3 s. a yard for 5 mo. and sell them again for 3 s. 2 d. ready money, the question is how much I gain per cent. allowing 6 per cent. Interest?

First, See what they cost in ready money, Thus,

l.	s.		l.	s.
102	: 10	—————	100	————— 3
			<i>facit</i> 2 s. 11 d. $\frac{5}{4}$	
s.	d.		l.	s.
2	— 11 $\frac{5}{4}$	—————	100	————— 3 — 2
			<i>facit</i> 108 l. 3 s. 10 d. $\frac{3}{4}$	

A Grocer doth sell Cloves for 4 s. per pound ready money. The question is how long time he must demand, when he doth buy the same Cloves at 3 s. 8 d. the pound to gain 13 l. per cent. per annum, without gain upon gain, at 6 per cent. Interest?

First, See what the gain is, if bought at 3 s. 8 d. Thus,

s.	d.		l.	s.
3	— 8	—————	100	————— 4
			<i>facit</i> 109 $\frac{1}{11}$	

Here is gained but 9 l. $\frac{1}{11}$, but he must gain 13 l. that is 3 l. $\frac{10}{11}$ more which must be gained by time; Therefore say,

If 6 l.	—————	12 mo.	—————	3 l. $\frac{10}{11}$
<i>facit</i> 7 mo. $\frac{9}{11}$				

Chap. 23. *Loss and Gain.* 191

A Linnen-Draper hath several sorts of Cloth, viz. 470 Ells at 2 s. 10 d. per Ell ready money, 730 Ells, at 2 s. 6 d. per Ell ready money, and 179 Ells at 3 s. 10 d. per Ell ready money, and he sells the Ell one with another for 2 s. 2 d. to be paid $\frac{1}{2}$ at 5 mo. $\frac{1}{2}$ at 6 mo. and the rest at 9 mo. Interest at 6 l. per cent. I demand what is lost per cent?

Ells	s.	d.	l.	s.	d.
470	—	at 2 — 10 is	66	11	8
730	—	at 2 — 6 is	91	05	0
179	—	at 3 — 10 is	34	00	2

1379 Ells cost ———— 192 — 02 — 10

1379 Ells sold at 2 s. 2 d. is 149 l. 7 s. 10 d.

Which sum being to be received as above said, will by Rebate at 6 l. per cent. come to no more than 144 l. - 17 s. 4 d.

Then say,

If 192 l. 2 s. 10 d. - 100 l. - 144 l. 17 s. 4 d.

facit 24 l. - 12 s. per cent. loss.

The second Head.

To know how a Commodity must be sold to gain or lose so much per cent.

Example.

If one pound of Nutmegs cost 9 s. 2 d. how much must it be sold for to gain 6 l. per cent.

Let

Let 100 l. be the first number in the Rule of Three, the price the second, and 100 l. with the profit added, or the loss subtracted, the third number.

If 100 l. be - 9 s. 2 d. price, what 106 l.
facit 9 s. 8 d. $\frac{2}{3}$

If a Barrel of Gunpowder cost 3 l. how must it be sold to lose 9 l. per cent.

If 100 — 3 l. — what 91 l?
facit 2 l. $\frac{73}{100}$

If one Gallon of Sack cost 5 s. 10 d. for how much must it be sold for to lose 8 l. per cent.

If 100 l. — 5 s. 10 d. — 92 l.
It must be sold for 5 s. 4 d. $\frac{2}{3}$

If 90 Ells of Cambrick cost 60 l. for how much must one yard be sold to gain 18 l. per cent?

It must be sold for 12 s. 7 d.

If a bag of Hops weight 16 C. - 1 q. 12 l. cost 27 l. 6 s. 8 d. for how much must the C. weight be sold to lose 8 l. per cent?

facit 1 l. 13 s. 3 d.

A Sugar-Baker hath 736 pound of Sugar that cost 13 d. a pound, and 137 lb. 12 d. a pound: I demand how he must sell the

23. Chap. 23. *Loss and Gain.* 193

Rule with the pound one with another to gain 9 l. per cent. First see what one pound cost.

facit 1 s. $\frac{67}{87\frac{1}{2}}$

6 l. d. $\frac{3}{5}$
It must be sold for — 1 s. $\frac{98\frac{1}{2}}{1000}$
to gain 9 l. per cent.

how
? If a pound of Mace cost 8 s. how must it be sold to gain 24 l. per cent?

$\frac{73}{100}$ facit 9 s. $\frac{23}{25}$

for 8 l.
If 5 yards cost 5 l. ready money, for how long time must it be sold for 95 s. to lose 20 per cent. without loss upon loss.

2 l. d. $\frac{2}{5}$
for gain
d.
12 l.
at the
If I lay out 100 l. ready money, and must receive but 95 l. there is 5 per cent. loss; but I must lose 20 l. per cent. that is 5 l. more, so that I must sell my goods, as if I sold that which cost me 100 l. for 105 l. Therefore see in what time 80 l. will amount to 95 l. at 6 per cent. and that will answer the question.

3 d.
If 100 l. lose 6 l. in 12 mo. in what time shall 95 l. lose 15 l?

Su-
7 lb.
sell
the
Or thus,
If 100 l. — 6 l. — 80 l.
facit 4 l. 16 s.
l. — 16 s. — 12 — 15 l.
K If

If one pound cost 23. *d.* ready money, for how long time must it be sold for 25 *d.* to gain 11 *l.* per cent. per annum, at 6 *l.* per cent?

Suppose I sell for 12 mo. time, then I gain in the price $8\frac{1}{2}\%$.

As thus,

If 23 d. — 100 l. — 25 d.
facit 108 ¹⁶/₂₅

But I must gain 11 £. that is $2\frac{7}{8}$ more
therefore this must be gained by time :

Thus,

$$6 l. \text{ --- } 12 \text{ mo. --- } 2 l. \frac{7}{23} \text{ --- } \text{facit } 4 \text{ mo. } \frac{8}{13}$$

This 4 mo. $\frac{84}{128}$ must be subtracted from 12 mo. and the remainder is the answer to the question.

facit 7 mo. $\frac{5}{3}$

If one yard cost $2\text{ s. } 9\text{ d.}$ ready money
at what rate must it be sold for $3\text{ mo. } \frac{1}{2}\text{ t}$
lose 3 l. per cent ?

First see what rate must it be sold for i
ready money to lose 8 l. per cent. Thus,

100 l. — 33 d. — 92 l.
facit 30 d.

If 30 d. $\frac{9}{25}$ be a ready money price,

Chap. 23. *Loss and Gain.* 195

must sell it for more, in regard I must stay 3 mo. $\frac{1}{2}$ for my money; therefore let 100 l. be your first number, and 100 with the interest for 3 mo. $\frac{1}{2}$ be the second number, and the last *facit* your third number; Thus,
 $100 \text{ --- } 101 \text{ l. --- } 15 \text{ s. --- } 30 \text{ d. } \frac{3}{4}$
facit 30 d. $\frac{8913}{10000}$

A Mercer buyeth Silks at 14 s. a yard for 7 mo. at what rate must he sell it again for ready money to gain 16 per cent. without gain upon gain?

First see what the yard is worth in ready money; Thus,

$103 \text{ l. --- } 10 \text{ s. --- } 100 \text{ l. --- } 14 \text{ s.}$
facit 13 s. $\frac{109}{207}$
 Then say if 100 l. — 13 s. $\frac{109}{207}$ — 116 l.
facit $\frac{812}{10, \frac{1}{2}}$ l.

The third Head.

When there is gained or lost per cent. to know what the commodity cost.

Example.

If 10 yards of Cloth be sold for 16 s. per yard, and there be 6 l. 10 s. loss per cent. the question is, how much the 10 yards cost?

First subtract the loss from the 100.

6 - 10

 39 - 10
 2. Let

196 *Loss and Gain.* Chap. 23.

1. Let the Remainder of 100 l. when there is loss; and the gain added to 100 l. when there is gain, be the first number; let the price be the second number, and 100 l. the third.

If 93 l. 10 s. — 8 l. — 100 l.

facit 8 l. - 11 s. ²³/₁₈₇

If 20 pound of Cloves be sold for 7 s. the pound, and I gain 9 l. per cent. The question is, how much the whole 20 lb. cost me?

$$\begin{array}{r} 20 \\ 7 \\ \hline 1410 \end{array}$$

109 l. — 7 l. — 100 l.

facit 6 l. ⁴⁸/₁₀₀

If I sell 28 Ells of Cloth for 4 s. per Ell, and thereby lose 24 per cent. I demand what the whole piece cost?

76 l. - 112 s. - 100 l. facit 7 l. 7 s. ¹³/₁₀₀

If 13 C¹/₂ of Indico be sold for 36 l. and I gain 13 l. per cent. I demand how much the C weight cost?

113 — 36 — 100

facit 2 l. ¹²³/₁₀₀

If 276 Fother of Lead, each 19 C¹/₂ be sold for 256 l. at 5 mo. I gain 11 per cent.

per

Chap. 23. *Loss and Gain.* 197

per an. the question is, how much the whole cost ready money?

$$111 \text{ l.} \text{ --- } 256 \text{ --- } 100 \text{ l.}$$

facit 230 l. $\frac{70}{11}$

The fourth Head

If Wares sold at such a Rate there is so much gained or lost per cent. how to know what would be gained or lost, if sold at another Rate

Example.

If Cloth sold at 8 s. the yard be 10 per cent. profit; what gain or loss per cent. should I have had, if sold at 7 s. per yard?

In questions of this nature, let the first price be the first number; 100 pound with the profit added, or loss subtracted, the second number; and the other price the third number.

Example.

$$\text{If } 8 \text{ s. --- } 100 \text{ l. --- } 7$$

facit 96 l. $\frac{1}{2}$

Loss per cent. 3 l. $\frac{3}{4}$

If one Gallon of Wine be sold for 9 s. and I lose 8 per cent. how much shall I win or lose when 3 Gal. is sold for 25 s. 10 d.

$$\text{If } 27 \text{ s. --- } 92 \text{ l. --- } 25 \text{ s. --- } 10 \text{ d.}$$

facit 11 l. $\frac{7}{8}$ per cent. loss.

If 10 yards be sold for 4 pound 10 s. I lose 12 per cent. what shall I win or lose, if I sell the same for 9 s. 9 d. per yard?

$$9 \text{ s. --- } 88 \text{ l. --- } 9 \text{ s. --- } 9 \text{ d.}$$

facit 4 l. $\frac{1}{2}$ loss per cent.

K 3

CHAP.

CHAP. XXIV.

Of Alligation.

I. **A**lligation is so named, because it teacheth to knit or bind together divers things of unequal prices, whereby to find how much of each must be taken according to the question propounded.

It is commonly divided into two parts, viz.

*Alligation Medial, and
Alligation Alternate.*

II. *Alligation Medial*, simply in it self, is no more then to discover or find out a common Medium, Rate, Price, or Proportion in the mixture of divers things together, which is performed by reducing the several prices to one Denomination.

Then multiply the quantity of each parcel by its price, and add all the products together; the which total divide by the number of all the parcels that are to be mixed, and the quotient is the answer to the question demanded: For

As the whole quantity is to the whole price, so is 1 to its own price.

Exam-

Example.

A Meal-man hath several sorts of Meal of several prices, and would mix them, so that the quantity mixed might be of one common price, viz.

3 Bushels at 3 s. — 5 d. a bushel.

4 Bushels at 5 s. — 6 d. a bushel.

6 Bushels at 4 s. — 8 d. a bushel.

Now the question is, what one bushel of this mixture is worth?

Bush. s. d. Bush. s. d. Bush. s. d.

3-at 3 5 4-at 5-6 6-at 4-8

12	12	12
<hr/>	<hr/>	<hr/>
41	66	56 123 3
3	4	56 264 4
<hr/>	<hr/>	<hr/>
123	264	336 6
		335
		723 3

13—723 — 1 facit 55 d. ⁸ per bush.

An Hostler mixed Provender for Horses, viz.

5 Bushels of Oats at 3 — 6 per bush.

3 Bushels more at 4 — 8 per bush.

2 Bushels of Malt at 2 — 2 per bush.

4 Bushels of Beans at 5 — 3 per bush.

The question is, what one peck of this mixture is worth?

K. 4.

Bush.

200 *Of Alligation.* Chap. 24.

Bush. s. d. bush. s. d. bush. s. d. bush. s. d.
 5 at 3-6—3 at 4-8—2 at 2-2—4 at 5-3

Reduce each quantity into Pecks, each price into pence, and multiply one by the other, then say as before,

If 56 Pecks-682 d.-1 Peck facit 12 d.

How to prove Alligation Medial.

Compare the total value of the several mixtures, with the value of the whole mixture, and if they come both alike the work is true; as in the former Example may appear.

Bush. s. d.	l. s. d.
5 at 3-6—	0-17-6
3 at 4 8—	0-14--0
2 at 2-2—	0-04--4
4 at 5-3—	1-01--0
	<hr/>
	2:16:10

(1
 (0
 682
 x22 (5 | 6

x—
 2-16-10

An

r.d.

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1

10

1

1

quaint you that as silver is estimated 12 ounces to the pound, and 20 penny weight to the ounce; so an ounce of gold is divided into 24 parts called Carects; now Refiners, Goldsmiths, and Mint-masters, to distinguish the differing fineness of either according as it indureth the fire: As for example, an ounce of Gold being tried, loseth 3 Carects, it is estimated 21 Carects fine; if it loseth 10 penny weight, it is esteemed 11 ounces, and 10 penny weight fine, &c.

A Gold-Smith is to melt 9 lb. 4 $\frac{3}{4}$ of gold Bullion of 16 Carects fine with 7 lb. 6 ounces of 22 Carects fine; the question is, how many Carects fine a pound of this mixture is worth?

Reduce them into $\frac{1}{2}$ ounces, and work as before.

facit 18 Carects $\frac{5}{8}$ fine.

Or thus,

$$\begin{array}{r} 225 \times 16 = 3600 \\ 108 \times 22 = 2376 \\ \hline 405 \end{array}$$

Then say,

If 405 - 7560 - 1. *facit* 18 Car. $\frac{5}{8}$ fine.

A Mint-Master hath 60 lb. weight of Gold.

24. Chap. 24. *Of Alligation.* 203

12. Gold of 23 Carects fine, and 80 lb. weight
 ight of 19 Carects fine; the question is, whe-
 vi- ther there ought any Al-
 Re- loy to be mixed with it
 to make a pound of this
 her mixture to be 21 Ca-
 for rects fine?

*An Alloy is a mix-
 ture of some baser
 mettal, as Copper,
 &c. to moderate the
 fineness of it.*

23	19	1389	60
60	80	1520	80
<hr/>			
1380	1520	2900	140
<hr/>			
140	—	2900	—
1 facit 20 $\frac{2}{7}$ Carects			
fine. But it should be 21 Carects fine.			

Wherefore I conclude this mixture is not
 fine enough by $\frac{2}{7}$ of 20 Carects fine; there-
 fore no Alloy is to be used, but more Gold
 to be put in.

*The second part of the Rule of
 Alligation.*

I. The former Rule required only a
 common rate or price from the whole of
 several quantities mixed together, but
 this requires a price and quantity in gene-
 ral composed of such particulars as the
 mixture is to be made of, and the parts to
 be taken proportionably according to the
 price, quantity or quality of each one.

Exama-

Example.

A Tobacconist having several sorts of Tobaccos, as some at 2 s. a pound, others at 3 s. a pound, other at 6 s. a pound, and the best at 7 s. a pound, and is desirous to mix 12 lb. together, so that he might sell the whole mixture for 4 s. a pound; the question is, what quantity of each must be taken to make up this mixture.

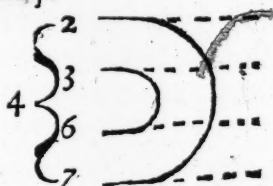
In order to the working of this question, and others following.

First, Set down the common number (or price) propounded (towards the left hand) which is 4 s. and likewise the prices given, viz. 2 s. 3 s. 6 s. 7 s. thus orderly one under another, as you have learned in Addition.

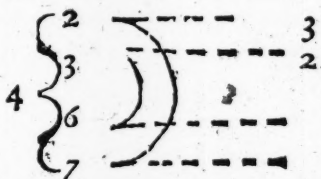
	2
	3
4	6
	7

2. Observe what sums are greater, and what are lesser than the common number, and couple a greater and a lesser together, by making a semicircle from one to the other; for two greater or two lesser cannot be mixt together, because two lesser being thus taken can never make so many as the com-

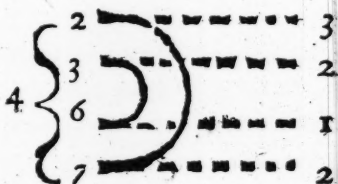
common number, and two greater will be two many.



3. Having thus linked them, observe what the difference is between each of the greater sums, and the common price; the which difference set directly against his fellow, which is linked with him.



Then likewise mark the difference between the lesser numbers, and the common number, and set each difference thereof against that which is linked with it.



Lastly,

Lastly, Add all the differences into one sum, which ought to be the first number in the Rule of Three; and the whole quantity to be mixed the second; and each particular difference the third.

$$\begin{array}{r}
 4 \left\{ \begin{array}{l} 2 \\ 3 \\ 6 \\ 7 \end{array} \right. \begin{array}{l} \text{---} \\ \text{---} \\ \text{---} \\ \text{---} \end{array} \begin{array}{l} 3 \\ 2 \\ 1 \\ 2 \end{array} \\
 \hline
 8
 \end{array}$$

Then work these according to the Rule of Three, and the fourth number will declare the exact proportion of the mixture:

For as the whole difference is to the whole quantity, so is each particular difference to each particular mixed.

1.

8 — 112 — 3 facit 42 for the first sort.

8 — 112 — 2 facit 28 of the second.

8 — 112 — 1 facit 14 of the third.

8 — 112 — 2 facit 28 of the fourth.

112

To prove this, and the like questions, multiply the whole quantity mixed by the common price, as here 112 by 4.

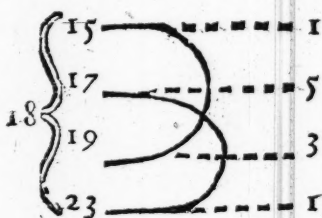
facit 448.

2. Mul.

Chap. 24. Of Alligation. 207

2. Multiply all the particular quantities found by its own price, as 42 by 2, 28 by 3, &c. and if the total of all the products agree with the former sum (448) your work is well done.

A Vintner hath four sorts of Wine of several prices, viz. some of 15 d. a Gallon, 17 d. a Gallon, 19 d. a Gallon, and 23 d. a Gallon, of which he is minded to mix the quantity of 32 Gallons. The question is, how many Gallons he must take of each sort to make the Gallon worth but 18 d.



10
Gall.

10	—	32	—	1	facit	$3\frac{1}{5}$
10	—	32	—	5	facit	16
10	—	32	—	3	facit	$9\frac{3}{5}$
10	—	32	—	1	facit	$3\frac{1}{5}$

32

A

A Druggest had 3 sorts of Drugs, one was valued at 4 s. the pound, another sort at 7 s. the pound, the third sort at 11 s. a pound; out of these sorts he made two parcels, either of them to be 30 lb. weight, whereof one of them thus mixed to be sold for 9 s. the pound, and the other for 10 s. the lb. How many pound must be taken of either sort to make each mixture?

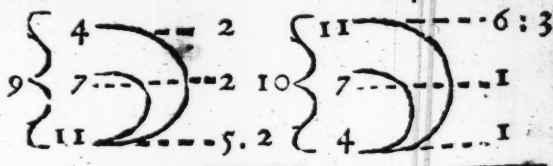
The price propounded in the first Proposition is 9 s. and in the other 10 s. likewise the prices given are 4 s. 7 s. and 11 s. but seeing two of these given prices are lesser than the common price, I cannot proceed to the former Example: Therefore I couple the two lesser with the greater, and their differences I set against the greater, and the difference of the greater against the 2 lesser, then work as before.

For as 11 the whole difference is to 30, the whole quantity, so is 2 the first difference unto 5 and $\frac{1}{2}$ for its quantity.

Chap. 24. Of Alligation. 209

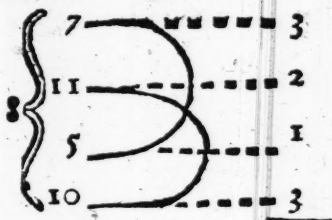
Proposition 1.

Proposition 2.



II-30-2 fa. 5	II-30-9 fa. 24
II-30-2 fa. 5	II-30-1 fa. 2
II-30-7 fa. 19	II-30-1 fa.

Barley at 7 Groats the bushel, Wheat at 11 Groats the bush. Rye at 5 Groats the bush. and Oats at 10 Groats the bushel, are so to be mixed as 100 bushels of the mixture may be sold for 8 Groats the bushel ; the question is how much must be taken for each sort.



9	100	3	facit	33 $\frac{3}{9}$	Barley.
9	100	2	facit	22 $\frac{2}{9}$	Wheat.
9	100	1	facit	11 $\frac{1}{9}$	Rye.
9	100	3	facit	33 $\frac{3}{9}$	Oats.
				100	How

How much Alloy must I mix with Bullion of 11 ounces $\frac{5}{8}$ fine, to abase the Bullion to 6 ounces $\frac{1}{2}$ fine.

$$\begin{array}{r} \text{ounces} \left\{ \begin{array}{l} 6 \frac{1}{2} \\ 11 \frac{5}{8} \\ 0 \end{array} \right. \text{ounces} \end{array} \quad \begin{array}{r} - 6 \frac{1}{2} \\ 5 \frac{1}{8} \end{array}$$

By this Alligation there must be taken 5 ounces, and $\frac{1}{8}$ of Alloy to mix with the 6 oz. $\frac{1}{2}$ of Bullion.

A Goldsmith hath 4 sorts of Gold, one finer than another, whereof one is 18 Caracts fine, 20 Caracts, 16 Caracts fine, and the fourth 22 Caracts fine : All these he would mix with such an Alloy, as that the whole mixture of 150 oz. should be 15 Caracts fine ; the question is, how much must be taken of each sort ?

To answer this, and others of this nature, set down as before the rate demanded at the left hand, and the particulars under one another, and subscribe a Cypher under all (for the Alloy unknown) to set the Alloys difference, which is 15, against all the other sums, according to the Example : then work as before, saying, as 76 the whole difference is to 150 the whole quantity, so is each particular difference to the quantity sought.

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20

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22

76

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76 — 150 — 15 facit 29 $\frac{23}{8}$
 76 — 150 — 15 facit 29 $\frac{23}{8}$
 76 — 150 — 15 facit 29 $\frac{23}{8}$
 76 — 150 — 15 facit 29 $\frac{23}{8}$
 76 — 150 — 16 facit 31 $\frac{23}{8}$

150

A Refiner hath several sorts of Bullion, viz. 30 lb. of 6 oz. fine, 16 of 8 oz. fine, 12 lb. of 9 oz. fine, and he would so mix them together, that a pound thereof should bear 6 ounces fine. The demand is, whether any Alloy ought to be mixed with it, and how much?

First, See by Alligation Medial what fineness an ounce of this mixture will bear when mixed together, then work as in the last question save one.

30	16	12	180	30
6	8	9	128	16
			108	12
<hr/>	<hr/>	<hr/>	<hr/>	<hr/>
180	128	108	416	58

(1
(0
416 (702.25
88

Therefore it is manifest that Alloy must be mixed to allay from 7 oz. $\frac{5}{29}$ to 6 ounces, which is to be done thus, and you will find for every 6 ounces of Bullion he must take 1 oz. $\frac{5}{29}$ of Alloy to mix with it.

$$6 \left\{ \begin{array}{l} 7 \frac{5}{29} \\ 0 \end{array} \right\} - 6$$

CHAP. XXV.

*Of Instructions for the measuring of any Sur-
facies, Board, Glass, Hangings, Pave-
ments, &c.*

I. **O**bserve that Board and Glasse, are usually measured by the Foot, and the Foot containeth 144 Inches.

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5. Chap. 25. *Of Measuring.* 213

There is a Table 24 foot in length, and 3 foot wide. I demand how many foot is contained therein?

The Rule is,

Multiply the length by the breadth, and the product giveth the content of the whole.

24

3

facit 72 foot.

There is a Table of 20 foot 9 Inches long, and 3 foot 8 Inches broad; how many foot doth it contain?

Reduce them into Inches, and multiply as before.

facit 76 foot $\frac{1}{2}$

How to measure Glass.

There is a House hath 26 panes of Glass in the Window, each pane being 2 foot 3 Inches long, and 18 Inches wide: The question is how many foot of Glass is contained in all?

facit 87 foot $\frac{1}{2}$

Pavements and Hangings are usually measured by the Yard.

1. Yard in length is 3 foot.

1. Yard square upon the Superficies is 9 foot.

How

How to measure Pavements.

There is a piece of ground to be paved, containing 49 yards in length, and 31 yards in breadth; how many yards is contained therein?

facit 1519 yarps.

A Gentleman had his door paved, being 37 yards 2 foot one way, and 7 yards 1 foot the other way. I demand how many yards are there in all?

facit 276 yards $\frac{8}{2}$

A suit of Hangings 45 yards $\frac{1}{2}$ long, and 2 yards $\frac{1}{4}$ broad: now many yards are there in all?

Divide by 16, because 16 quarters is one yard square.

facit 102 yards $\frac{3}{8}$

*Instructions for the measuring of Solids,
as Timber and Stone, &c.*

12 Inches is one foot in length.

144 Inches is one foot square superficies.

1728 Inches is one foot solid.

There is a stone of 4 foot long, 3 foot broad, and two foot deep. I demand how many square foot is contained therein?

The

The Rule is,

Multiply the 3 Dimensions one into another, and the product is the answer.

facit 24 foot.

A Stone of 5 foot 9 Inches long, 4 foot 7 Inches broad, 2 foot 8 Inches deep : I demand how many foot there is contained in the said Stone ?

Reduce all the Dimensions into Inches, and divide by 1728.

facit 70 foot $\frac{1}{2}$

How to measure Timber.

A piece of Timber 20 foot 8 inches in length, 2 foot 5 inches broad, and 2 foot thick : how many foot doth it contain ?

facit 99 foot $\frac{3}{4}$

A Country man borrowed of his neighbour a stack of Hay, the Content whereof was 40 foot square — When the time of payment came, he told his Neighbour he could not pay him altogether, but he would pay him 20 foot square at that time, and 20 foot square more at another time afterwards, which he performed : The question is, whether he paid the full quantity borrowed, or what was wanting thereof.

40
40
—

1600

40
—

64000 borrowed.

20
20
—

400

20
—

8000

8000
—

1600 paid.

So that he paid but one quarter of the quantity he borrowed.

There are many things of this nature that might be brought in under these two heads, which are more difficult, as the measuring of Land of several forms; and the measuring of Timber, Stone, or other things not equally squared; the well managing whereof would require a Treatise of it self, which I omit, in regard it doth not so much concern my practice, nor my attention in this Tract; but I judge this sufficient for the present.

Latus Deo.

F I N I S.

London, Printed for Tho. Rooks, in Gresham Colledge, next the stairs, entring upon the Exchange, near Bishopsgate street; who makes and sels the best Ink for Records.

4

